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MEN AND THE MUNITIONS ACT. *See p.* 484.

SHIPBUILDING AND SHIPPING RECORD. *December* 2, 1915.
REGISTERED AT THE G.P.O. AS A NEWSPAPER.

SHIPBUILDING AND SHIPPING RECORD

A JOURNAL OF SHIPBUILDING, MARINE ENGINEERING, DOCKS, HARBOURS AND SHIPPING

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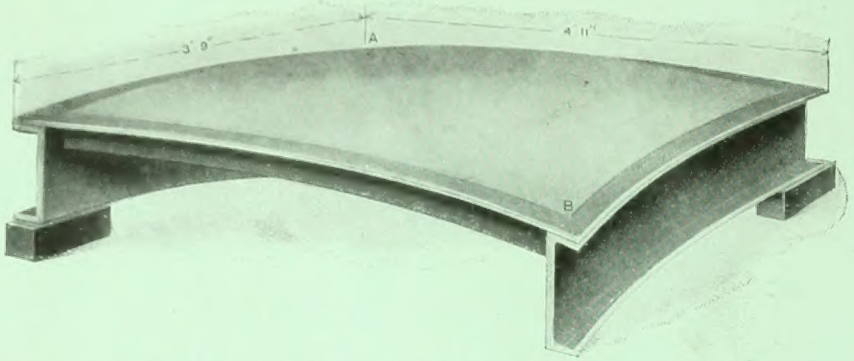

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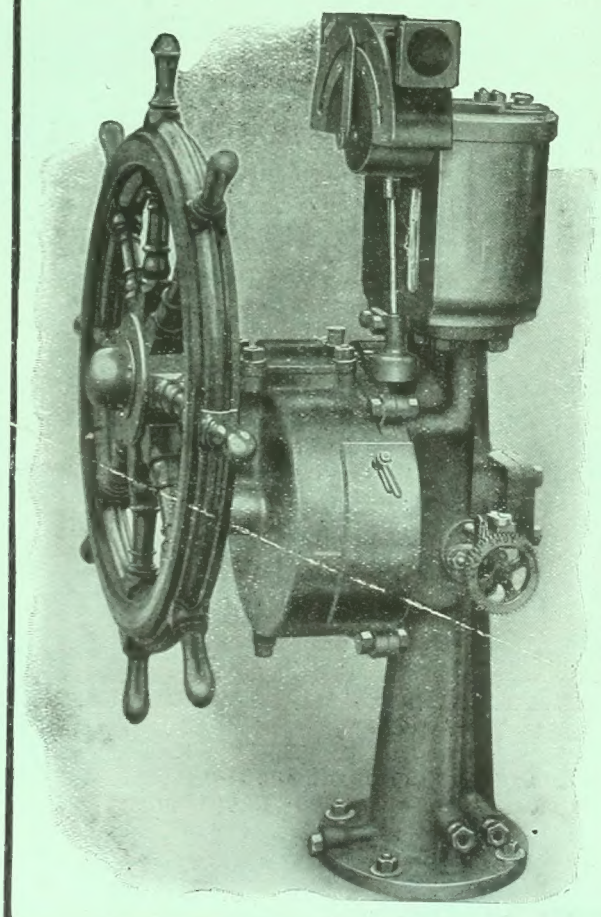

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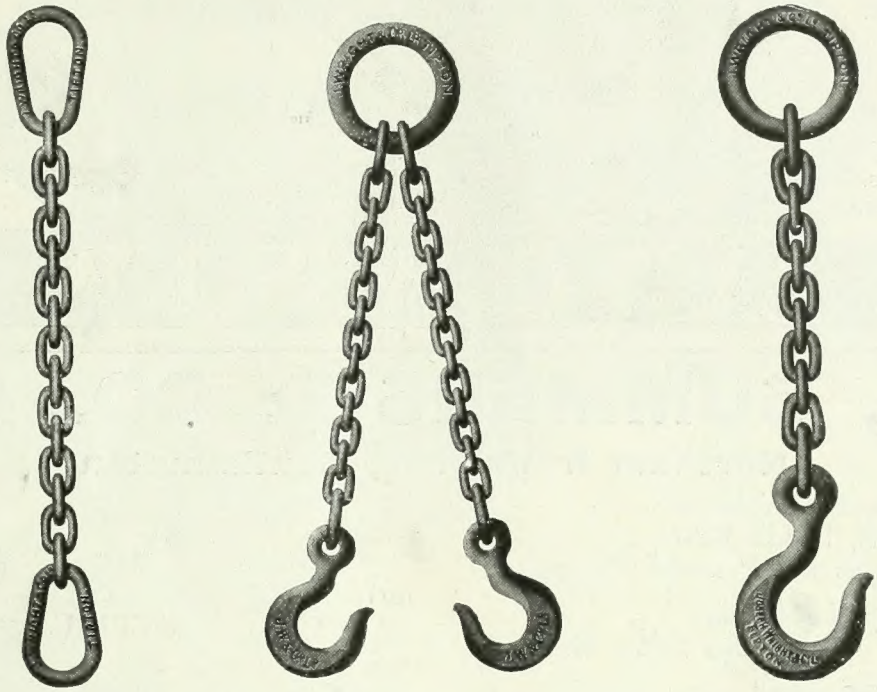

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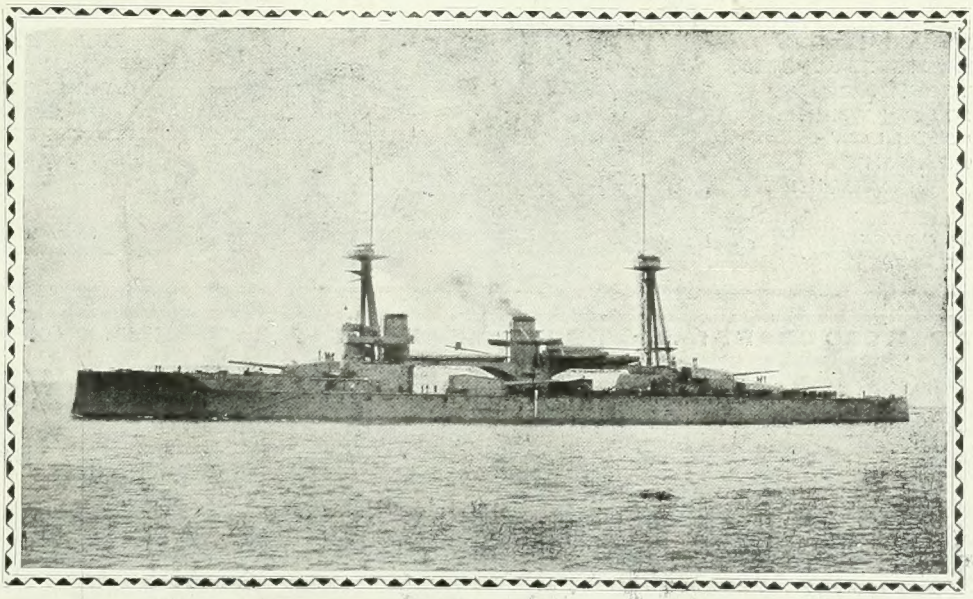

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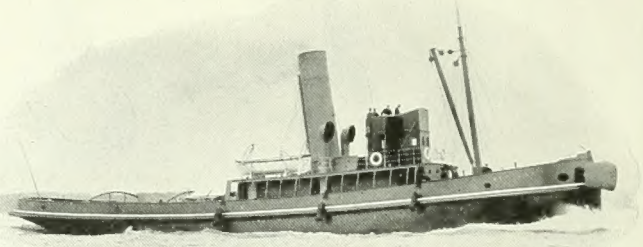

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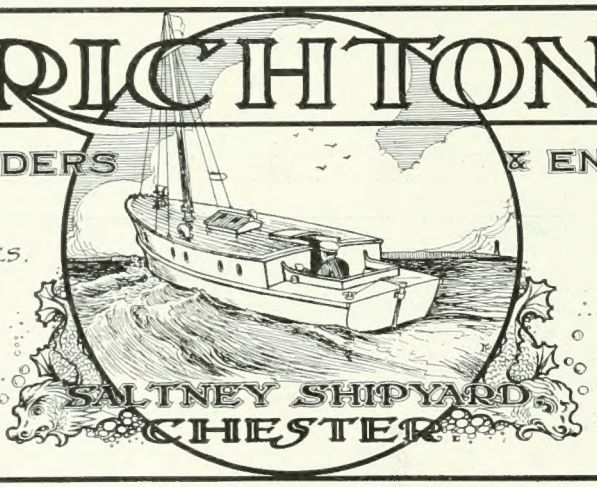

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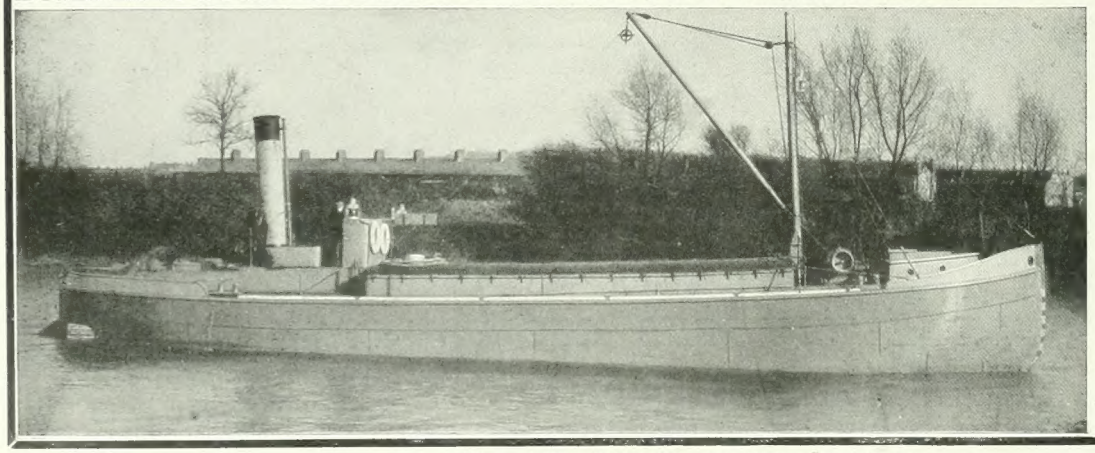

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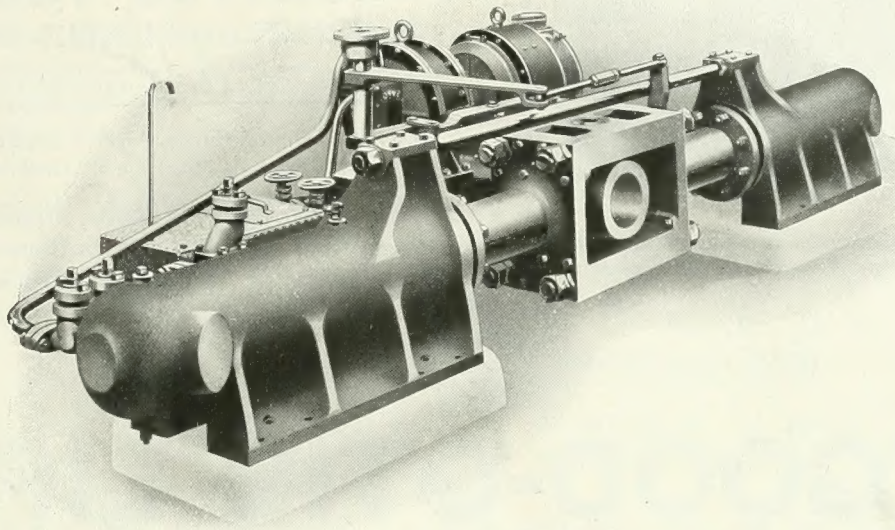

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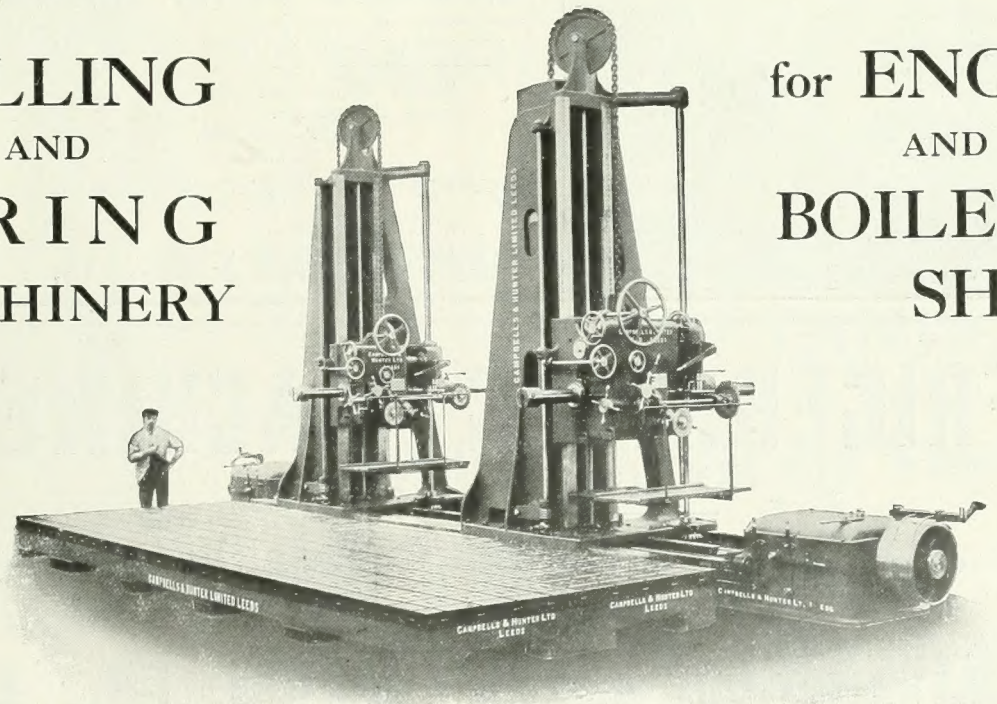

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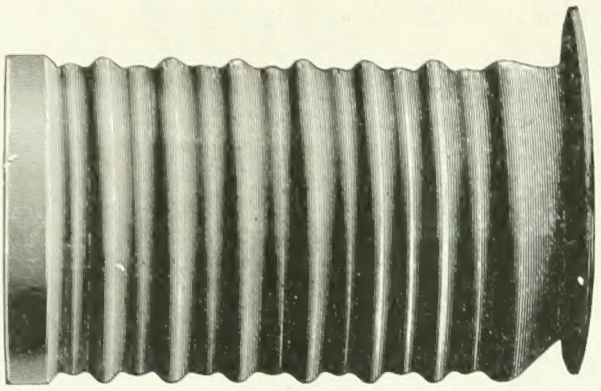

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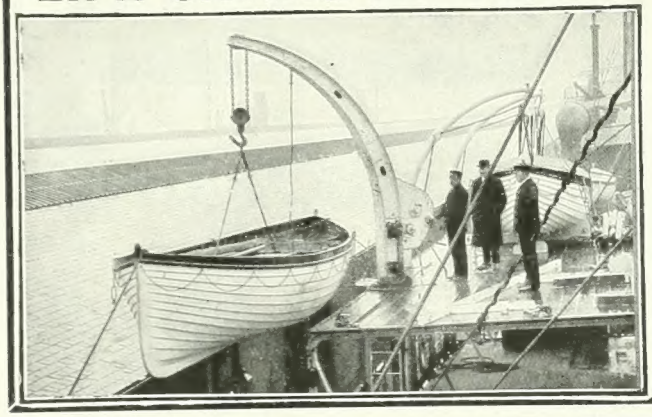

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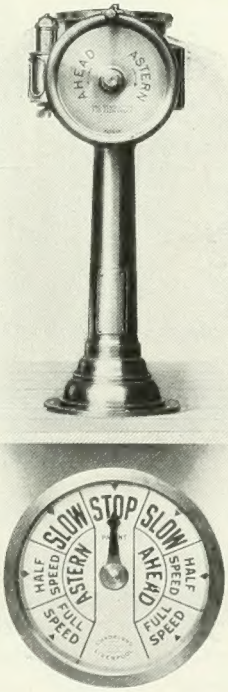

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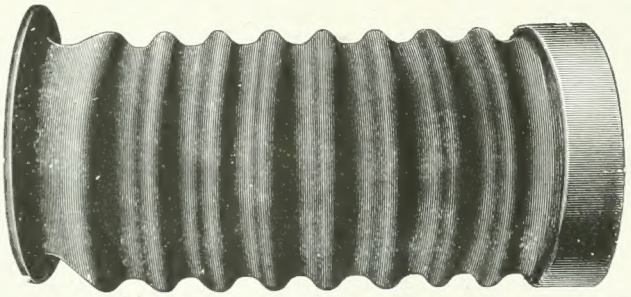

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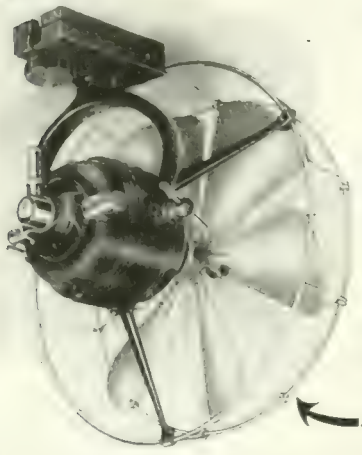

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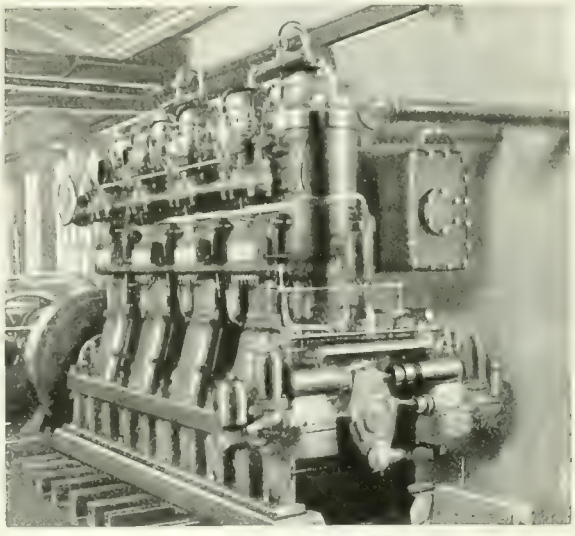

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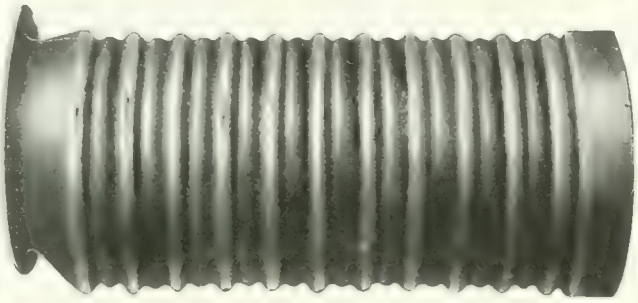

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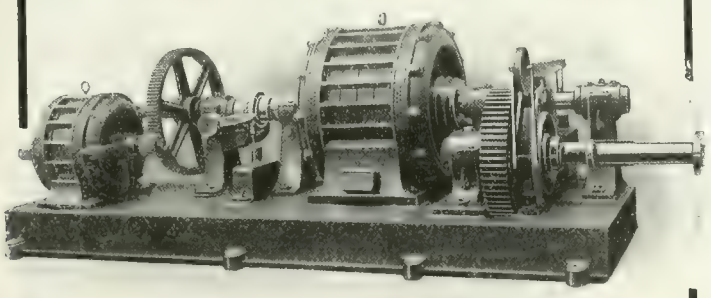

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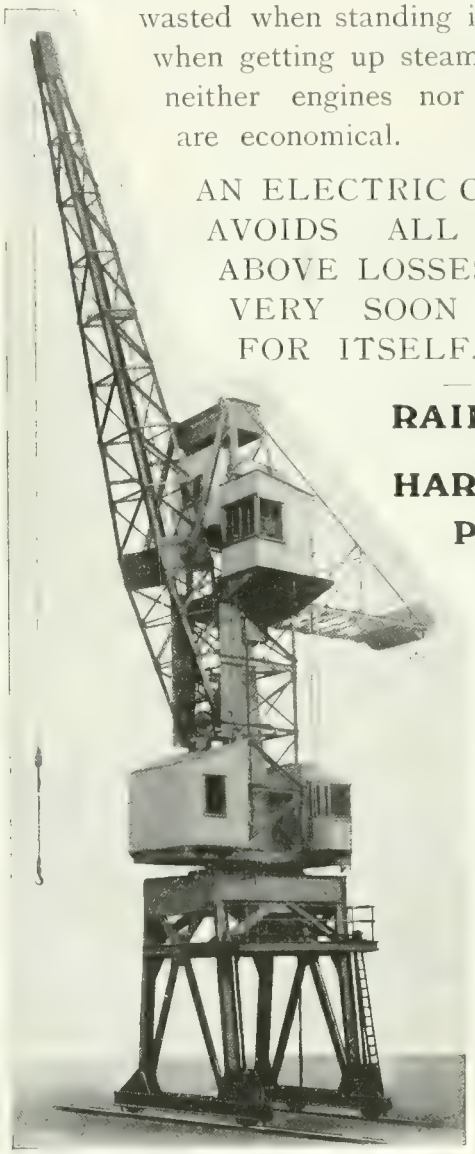

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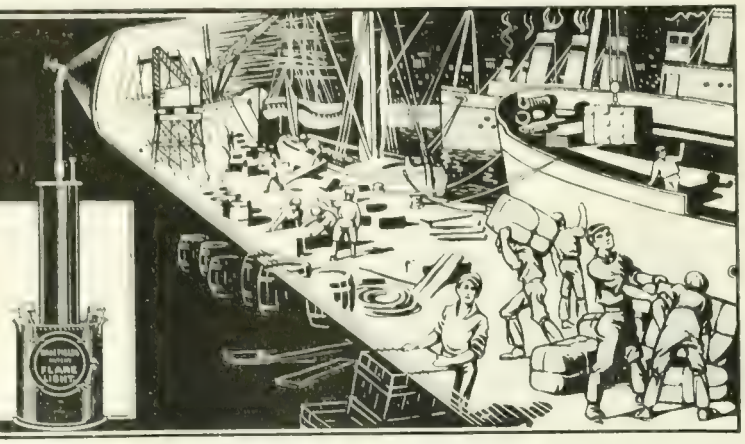

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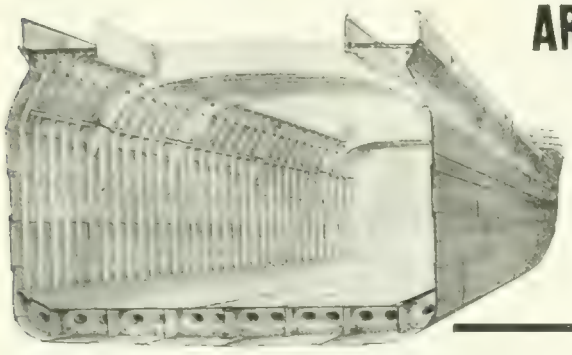

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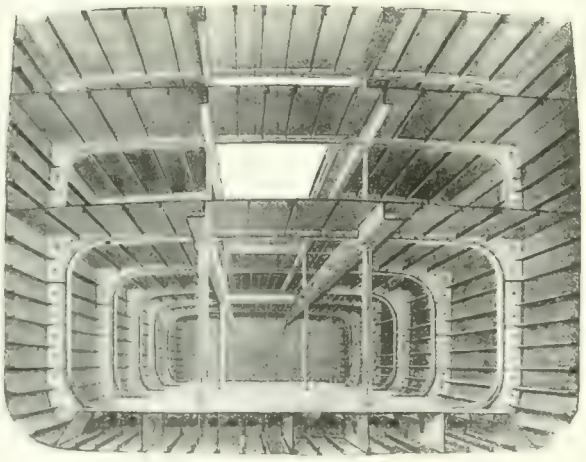

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A JOURNAL OF SHIPBUILDING, MARINE ENGINEERING, DOCKS, HARBOURS AND SHIPPING

Published Every Thursday at
QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON, S.W.
Branch Offices—
Glasgow: 87, Union Street. Newcastle: Lloyd's Bank Chambers.
New York: Woolworth Building.

Telegraphic Address: "Recordship, London." Telephone No.: 2247 Victoria.

Subscription, including regular weekly and special issues, published from time to time, payable in advance and postage free:

British Isles	£1 5s. 0d.
Elsewhere	£1 12s. 0d.
Single Copies	Sixpence.

The Editors will be glad to consider articles and paragraphs submitted by competent writers. All accepted contributions will be paid for. Whilst every care will be taken to return unsuitable articles, photographs and drawings (when a stamped addressed envelope is enclosed for that purpose) the Editors cannot hold themselves responsible for the safekeeping of unsolicited contributions.

Vol. VI. Thursday, December 2, 1915. No. 23.

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THE report of the Peninsular & Oriental Steam Navigation Company differs from and is less elaborate than those which the proprietors received when Sir Thomas Sutherland was Chairman, and the details which were found in the general working account are absent, their place being taken by a profit and loss account. We publish the report *in extenso* on page 495, and from this it will be seen that the Government have taken over 31 of the company's fleet, although this notwithstanding the mail service has been maintained. The amalgamation with the British India Company, of which this is the first year's working, is said to have resulted in effecting many economies and advantages to the public. The pensions fund has been placed on an actuarial basis by the addition of £100,000 from profits to the Provident Good Service Fund. The profits for the year amounted to £431,200, compared with £291,000 for the previous year, but expenses such as £250,000 for war risk insurance are a heavy item. The carry forward is £78,182, or £9,500 more than the previous year. No new tonnage has been laid down. Indeed, the company still await delivery of two steamers which should have been finished this autumn. Consequently, instead of investing the amounts set aside for depreciation in new tonnage, as would have been the case in normal circumstances, the directors have placed them, together with the proceeds of certain securities which have been sold, in the Government War Loan and Treasury Bills. The dividend remains at 15 per cent. The presentation of a report of this character is a striking reply to the bombastic utterances of German shipping magnates who seek to hide the truth from their shareholders and their own countrymen.

The P. & O. Report.

For some little time past the possibility of oil superseding coal has been the subject of several articles in the pages of the *Shipbuilding and Shipping Record*. That oil is gaining ground to the detriment of coal is certain, and furthermore the insufficient supplies of tonnage to transport the world's commerce, and particularly coal from the United Kingdom, is helping to oust King Coal from the market. At the monthly meeting of the Cardiff Chamber of Commerce last week the head of a prominent Welsh coal exporting firm, during the discussion on the tonnage shortage at home ports and the enormous strides made by the American coal trade since the outbreak of war, made the interesting and important announcement that one of its Argentine customers, who took about 10,000 to 15,000 tons of Welsh coal annually, had been lost to them for the next couple of years, the undertaking having contracted for supplies of oil.

Oil v. Coal.

In the days when values of steamers fluctuated but little from year to year the risk of Excess G.A. and R.D.C. was very often included in a total loss policy without extra premium or with a very slight augmentation. Now that values have increased so tremendously and are still on the up grade, underwriters who have been accepting lines for these risks on the old conditions will find that they have greatly underestimated the gravity of the risk, when claims begin to come in. An instance which emphasises this point has recently occurred. A steamer valued at just over £50,000 stranded when nearing her destination. Had she arrived she would have been delivered to new owners, who had advanced sufficiently in the transaction of her purchase to place fresh insurances on her, the value in the new policies being well over £100,000. This then may be taken as her actual value at the present moment, and the difference between the two values—some £50,000—represents the amount at risk for Excess G.A. and R.D.C. Surely a large amount to be included for a nominal percentage on the old valuation!

Excess G.A. and R.D.C. Risks.

The scheme for expediting the completion of policies at Lloyd's is progressing favourably, although some opposition was met with on the first announcement being made. This opposition in most cases arose from a fear that careful scrutiny would not be made of the policies, and that underwriters might find themselves liable for risks which they had not contemplated. A full explanation has in most cases caused hesitation as to the system's acceptability to be withdrawn and the remaining opposition is of the slightest. A committee which has been appointed to deal with the scheme has met on several occasions. Premises for the housing of the bureau have been considered, and although it will not be easy to find suitable accommodation in the vicinity of the Royal Exchange, the problem is by no means insoluble. It is believed that the system will be working in the early months of 1916, and in view of the fact that by that time so many of the juniors in brokers' and underwriters' offices will be taking up their military duties, the clearing house system should prove the saving of an otherwise difficult situation. In the opinion of those responsible for the scheme it will not only do this, but will prove a permanent benefit where temporary amelioration alone was looked for.

Lloyd's Clearing House.

The policy of the Clyde Trustees for many years past has been to extend and develop the harbour and docks of Glasgow so as to provide accommodation for shipping just a little in excess of the actual requirements of the port. This is an eminently safe policy to adopt in normal times, but it has broken down completely as a result of the war. Prior to the outbreak of hostilities preparations were being made for another big extension of docks

Clyde Shipping Traffic.

at Glasgow, and as it has been impossible to proceed with this scheme while the war lasts the demand for berthage and shed accommodation greatly exceeds the supply. The result is that a good deal of delay occurs in connection with the loading and discharging of vessels. Cargoes are, as a rule, heavier nowadays than formerly, and vessels often require more than one berth to load or discharge. In ordinary circumstances this would occasion no great trouble, but with every berth occupied individual shippers cannot trespass on neighbouring berths, with the result that work proceeds more slowly and firms who have to handle large cargoes are at times badly hampered for space. Then the labour available is insufficient, and there is also a shortage of railway and cartage facilities for the removal of goods. The harbour authorities are, however, making strenuous efforts to cope with the exceedingly heavy volume of traffic, and it is satisfactory to note that their efforts are meeting with a good deal of success.

Rent in Munition Areas.

Friction has occurred in munition districts which we need not at present specify, over the tendency of house rents to rise. No doubt the law of demand and supply has been in operation, but owing to certain abnormal features of the situation, it appears to us that the Government has taken a prudent course in introducing a Bill by which the rents of workmen's dwellings will be standardised at a pre-war level. For the main part the provisions of the measure will be applied only to munition areas. We are fully conscious of the fact that many of the work-people employed in the manufacture of war material have been earning wages in excess of anything to which they were formerly accustomed. At the same time it is true that by the restriction of labour and capital in the building trade, a stop has been put to the erection of new houses in the country, and this factor alone would tend to raise rents in districts into which an influx of population has taken place. This is one of the reasons which the Government brings forward in justification of its Bill. Another is that the rise in wages has not been universally shared by work people who although they live in munition areas are not engaged in the production of munitions. We have to suffer many necessary evils in war time and in that spirit this Bill may be accepted. But it violates a sound principle of economics, and there would be no justification in perpetuating it in times of peace. All we hope is that it will eliminate any friction which impedes the steady output of material of war.

Emigration Traffic Prospects.

Acknowledged authorities are in hopeless disagreement as to the future of emigration from Europe and well they might be seeing that the difficulties of the situation are both many and obvious. Some are of opinion that an increase in the burden of taxation, and the pressure of economic conditions generally, will result in driving people wholesale from the war-stricken countries to the Americas or Australasia while, on the other hand, there are others who contend that the enormous loss of life and incapacitation arising from wounds, will result in a huge demand for labour for the huge amount of reconstruction that will be necessary when hostilities come to an end. In the latter event, of course, the Governments concerned would take effective steps to prevent any great volume of emigration to the great disadvantage, naturally, of business enterprise on the other side of the Atlantic. And another view which, by the way, alone concerns the United Kingdom, is that thousands of Britons, impressed by the glories of Canada, South Africa, Australia, and New Zealand, of which the most is, no doubt, being made by the patriotic sons of our Overseas Dominions will be attracted to them. Nevertheless, no matter how ample may be the scope for divergence of opinion on the subject, it is much to be hoped that our present enemies will not be afforded the facilities which they formerly enjoyed to compete with our own shipping companies, even at British ports, while they were allowed to erect barriers at their frontiers for the diversion of emigration to their own steamship lines. Russia, we understand, has already decided that the Hamburg and Bremen concerns will no longer control either her outward or inward passenger and cargo traffic. In this connection, Mr. H. W. Dillon, the well-known London shipowner, proposes the exclusion of the German lines from British ports and colonies, and it is a suggestion that is certainly well worth serious consideration.

French Shipping Developments.

The activities of the French mercantile marine, like those of the British, have for a long time been largely confined to operations arising out of the war. Nevertheless, affairs have not been altogether at a standstill, and when conditions are again normal it is understood that French shipowners will assume a position of greater prominence than has hitherto been the case. As already announced in these columns, the Messageries Maritimes will devote more attention to the cargo trade of the South Seas, particularly the French Possessions there, and, at the same time, the Indo-China service of the company, for which another mail steamer has been built, is to be improved. The Compagnie Transatlantique is also showing greater enterprise, and, in fact, a few days ago a new boat of 18,000 tons was placed on the Bordeaux–New York route. Moreover, the Société Générale des Transports Maritimes is about to establish a regular service of cargo boats between Marseilles and New Orleans, while, as the result of a recent conference in Paris, it is likely that an improvement will soon take place in the commercial relations between France and Denmark. Then, too, at Puget Sound, a movement is on foot with a view to the inauguration of a French service, more especially for the timber products of the Pacific North-West. As regards this country, several new lines have already been established to France, one of the latest providing regular sailings between Hull and Havre. In fact, notwithstanding the existence of unpromising circumstances, which time, however, will alter for the better, the maritime outlook in France is believed to be satisfactory in every respect.

Enemy Interests in British Shipping.

Attention has been called in Parliament to a matter which we commented upon some time ago, the laxity of the British law which tolerates the existence of shipping companies registered in this country but in reality owned by alien enemy shareholders. This indeed is part of a wider question the position of companies of British registration in which German and Austrian capital predominates, and we hope it is true that in spite of the Attorney-General's rather discouraging speech on the subject the Continental Tyre Case in which the whole matter is raised will be taken to the House of Lords. It was pointed out, as will be seen from our report on page 497, that the shipping aspect has its own pressing peculiarities. The principle on which the British Merchant Shipping Act proceeds is that the ship which flies the British flag must be British owned. That is a matter of public policy, but it is in the present declared state of the law circumvented by means of a loophole, in the Companies Act which attributes a British character to all companies registered here. We see that Mr. Butcher emphasised the point which we made that these shipping concerns manage to evade the Prize Court for their vessels, and under the protection of the British Navy earn returns for their shareholders. It is true that the dividends do not so long as the war lasts pass to alien enemies, but we are justified in asking whether on its conclusion these sums will be transmitted to them. As matters at present stand it seems likely unless the Government and Parliament intervene in the meantime that the accumulated dividends will so pass. The whole question should be looked into very closely.

Professor Abell's paper on "Some principles underlying the watertight subdivision of ships," recently read before the Liverpool Engineering Society, was comprehensive in scope and deeply interesting. The lecturer briefly reviewed, both from the theoretical and practical points of view, the effects upon the stability and the flotation powers of a vessel of the various types of subdivision. One point the professor made is worthy of note. He showed that the transverse stability of vessels in a damaged condition becomes less with extreme proportions of beam to draught. In relatively narrow ships there will be no loss in metacentric height due to bilging, and it appears that the stability of a ship subdivided by transverse bulkheads in a damaged condition only becomes of much importance when the transverse proportions are extreme. If the ratio of beam to draught is large a ship is liable to be unstable in a damaged condition. It appears to the Professor that the freeboards assigned both by the 1890 and the recent Bulkhead Committees, which does not vary with beam, are not thoroughly sound in this respect and there seems to him to be very little reason why allowances for such variation should not be provided. Whilst it may have been possible to have incorporated a factor for beam in the freeboard as Prof. Abell suggests, we doubt whether it would have been wise to have still further complicated the method of determining the subdivision of ships. In the majority of ships the loss of B.M. due to bilging is compensated for by a decided rise in the centre of buoyancy, and it will only be in exceptional proportions that a loss in transverse stability will occur.

Principles Underlying Subdivision.

The sound practical value of the experiments which Mr. Baker described last Friday to the North-East Coast Institution, will appeal to shipowner and shipbuilder alike. Experiments have been made with a brass model which represented a vessel of 400 ft. in length with raised and sunken strakes of plates. It was first tried with flush butts, the strakes running continuously without break from stem to stern. The increase in frictional resistance due to plate edges only, was found to be almost 4 per cent. The strakes were then broken, and lapped butts worked to give a reasonable shift over the bottom. With this arrangement, the resistance was increased by over 10 per cent. Whilst it is possible that this increase was greater than what might be expected in the full-sized ship, the adoption of lap or strap butts must lead to greater resistance than would be created by flush plating. Mr. Baker recommends the adoption of flush butts over at least one eighth of the length of the ship at the fore end, he having found that the locality of excessive roughness affected the amount of the resistance measured. From time to time points of practical interest and importance are investigated by experimenters, and valuable guidance is given as to how to minimise resistance. The gradual accumulation of important experimental results is having an influence on the forms of ships and on details of their construction. When shipowners begin to realise that such experimental data has an important bearing on the cost of running ships, the study of papers such as that given by Mr. Baker will be more widespread than at present. We report the proceedings on page 492.

Resistance.

All who are interested in high-pressure turbines will find the following facts of interest. The writer has been for many years in charge of practically all types of high-speed engines, but this is the first instance that such a remarkable coincidence has been noted. The turbines, of the Parsons type, developed 25,000 h.p. The engines are identical in all respects, and run at 640 r.p.m. at full speed. The first case was as follows. Steam was on the turbines for 24 hours, the whole time the ship was being manœuvred, with consequent change in revolution speed. She was also anchored as required. For the whole time the revolutions worked out at 40,440 port, and 40,440 starboard. The variation in revolutions being from 0–520 per min. In the second case similar conditions obtained, but in this case the revolutions varied from 0-340. The total revolutions for the 24 hours worked out at 51,950 port and 51,950 starboard. In each case the revolutions were recorded on an instrument showing $\frac{1}{10}$th speed of turbine. Both the above cases occurred within six days. Considering all the changes in speed, the writer thinks the above figures constitute a record.

Coincidence in Revolutions.

The method described below has been most successfully adopted for taking up end thrust of a dynamo engine fitted on board ship. The dynamo was of the enclosed forced lubrication type (reciprocating), and no means were fitted for taking the end thrust. As the ship rolled very considerably, the wear was taken on the webs of the cranks, and the glands gave trouble through the rods being constantly thrown out of the centre line. The commutator end bearing observation cap was removed, the end of the shaft here being of course lubricated from the general forced system. A screwed bolt was fitted through this end cap, being provided with an adjusting nut on the outside. On the end of the bolt a circular pad of white metal was secured, of the same diameter as the engine shaft. Concentric oilways were cut on the face of the pad. It will thus be seen that when the cap carrying the bolt was replaced, the white metal pad could be brought up against the end of the main shaft by adjusting the bolt outside. The engine shaft was then put dead central with the cranks, and the pad adjusted to within $\frac{1}{1000}$th of an inch from the shaft end. It was found that sufficient oil was provided by the concentric oilways working in conjunction with the main system. After running for a considerable period no apparent wear was noticed, and the engine ran quite satisfactorily, even in the roughest sea. In addition to this, the glands were quite free from leakage, the wear on the rods being practically nil.

Dynamo Engine End Thrust.

The following should prove of interest to all who have to run trials, or are in charge of high-power turbines. The turbine in question was of the Curtis-Parsons type and developed approximately 12,000 h.p. On attaining a speed of 240 revolutions, the full speed being 600, a slight rattling was noticed, apparently inside the casing. This rattle increased to a dull humming sound as the speed was accelerated, but at full speed the sound was not noticed. A stethoscope was used, and the alteration in tone of the humming carefully observed. The sound, as far as could be ascertained, was caused either by loose blades, or a portion of the shroud wire having become detached from the blades. The turbine was stopped and, when cool enough, the large inspection door on the eduction bend removed. On rotating the turbine by hand no noise could be heard. All stay rivets were then tried, and it was found that three rivets in the flat plate stay running across the top of the eduction bend were very slack. Although it was considered that this was insufficient to cause the humming, the rivets were carefully re-riveted tightly, and the turbine closed up. Trials were then run at varying speeds, and no trace of the humming could be heard. Since that time the turbine has run approximately 10,000 miles, but no further trouble has been experienced.

Humming in Turbine Casing.

The obvious advantage of high vacuum in a turbine, particularly in a low-pressure turbine, with the known difficulty of designing, building or keeping glands vacuum-tight without the necessity of a water seal with its attendant piping and subsequent sediment troubles, has led to the departure from the orthodox straight-flow principle to the return-flow design for the elimination of this long-standing bugbear in turbine work. This question of gland

High Vacuum in Turbines.

leakage often results in trouble between the turbine and the condenser makers when trying to meet guarantees, while the customer looks on and sees the machine run at a lower vacuum than called for and pays the coal bill anyway. One contemporary *Power* states that it is often given out that with a steam seal on the glands and a little steam blowing outward into the engine room there cannot be any air leaking into the turbine. This contention is wrong, as has been demonstrated many times. It often happens that there is a current of steam going on, air travelling along one part of the gland and steam passing out of the glands in the opposite direction, this condition being the hardest possible phenomenon to detect. One other important feature in connection with the arrangement of glands on the return-flow turbine is that no supplementary steam supply is necessary for sealing them when under full load, and even at light loads any steam that finds its way through must pass through the low-pressure end of the turbine, thereby doing work, whereas with the ordinary type of steam-sealed glands all the steam which does manage to escape goes directly to the condenser without doing any further work. That this auxiliary steam supply can amount to quite a factor is evidenced by various tests that have been made.

THE FUTURE OF GERMAN SHIPPING.

IN the course of a long contribution to *Hansa*, a contributor sets out to answer questions which he imagines would arise were German owners and merchants asked their opinion on the prospects of German shipping after the war. "Black pessimists with care-worn frowns," who consider that German shipping will have to begin all over again, are determined as promptly as those cautious beings who ask how it is possible to tell with certainty how shipping will fare after the war. Others, the writer evidentally among them, "see the future of German shipping in a resplendent frame."

To those who demand "What if England continues naval warfare on her own responsibility?" the author replies that the Englishman is a cold calculator, very sensitive in his pocket and prepared to sacrifice British pride and honour directly there is no money to be made from it. "Suppose," says the author fresh from this flattering estimate of our character and soaring to yet higher flights of fancy, "suppose the Russian army completely beaten, and after it the French-English-Belgian armies, can one believe that the English, after the complete defeat of their Allies, will yet have the spirit to continue a costly naval war at their own expense?" Apparently the answer is obvious—at any rate none is given.

"Others fear that England will not rest till she has embroiled us in war with America." The writer tactfully expresses the hope that President Wilson will "better appreciate our position, proposals and wishes as our armies advance to yet further victories," although Uncle Sam seems to lack appreciation of the sinking of the *Lusitania*, *Arabic*, and other ships.

The little problem as to "Where shall we get the necessary ships, since most of ours are prisoners abroad?" is to be settled by the German owners and Government who "will see that the necessary number of ships are available at the right moment. Most of them will have to be given up to us by our enemies." That sounds simple.

After this, it must be disappointing to Teutonic readers that "shipping traffic will not recommence at express speed immediately after the war, because many threads and connections will have to be re-made." German clients abroad will have looked round for fresh markets, and it will take much pains to uproot the poisonous crop of calumnies which has been spread concerning the poor German. The writer appears to find it incomprehensible and very culpable that the Allies should think of supplementing their military measures by a commercial boycott. He comforts his readers, however, with the assurance that the Allies will quarrel among themselves so quickly that any attempt at a commercial union is foredoomed to failure. Not without reason is the German language alone in its possession of a word of the exact shade of meaning of *Dummheit*.

The only thing German shipping has to do apparently is to be ready to get to work before we can free our merchantmen from transport and other military duties. That hardly sounds as though we are to be utterly crushed, which is consoling. It is suggested that there may be a temporary depression in German shipping after the first rush of traffic is over, due to "commercial uncertainty and the lack of a lively stimulus in the gold market." Can it be that the author has overlooked the stimulus of the handsome indemnities which one would expect to follow from his supposition of the Allied armies' complete overthrow? He sticks to his guns, however, in dealing with the unkind suggestion that Germany may be inspired, in her commercial *entente* with Austria, by a desire for fresh markets to replace those lost abroad. German overseas trade will not be found to be permanently injured and it must not be neglected.

In the second instalment of this pæan of self-praise, the *Los von London* (free from London) cry is exploited and the reader is told that Germany is strong enough to free herself from British domination in freight and insurance business if only German owners, brokers, merchants and banks will combine and—the panacea—the necessary capital is forthcoming. Apparently English tramp owners are to go by the board if German owners consider it "advantageous and necessary." German building orders must, of course, no longer go abroad, and in the North Atlantic service, a German combine must stand against all comers.

WORKMEN AND THE MUNITIONS ACT.

BY the time this issue of *Shipbuilding and Shipping Record* is in the hands of readers the text of the Munitions of War (Amendment) Bill will no doubt be available. That is, at any rate, a not unreasonable conclusion to draw from the fact that the object of Tuesday's conference between the Minister of Munitions and the executives of, what may be called, the Munitions Trade Unions was to obtain an agreed measure. In the first draft of the Bill—the draft, that is, which was considered by the National Advisory Committee—most of the serious deficiencies of the Act were made good. Some of the clauses proposed, it is true, merely to increase the Minister's powers; but on the other hand several dealt quite satisfactorily with the more important of the men's grievances. That sections of the men did not think so was, however, made very plain by the number of suggested amendments put forward last week and this week by the Amalgamated Society of Engineers.

We have nothing to say either for or against these A.S.E. amendments or for or against any of the other amendments which it occurred to men in the shipbuilding and engineering districts to propose. We shall be quite content with the legislation in whatever shape the amending process leaves it—not, of course, because it is or promises to be scrupulously fair to employers, but because it is a war measure which is deemed to be by the only people who are in a position to know—necessary in the national interest. Employers like the compulsion which the Act exercises as little as the men do. That is a fact of which the men seem to be unaware. Repeatedly, for instance, workmen have declared that the Act gives employers power to do this, that and the other thing. It does not. Employers have no more power under the Act than workmen have. They are both subject to the discipline of the Munitions Tribunals, and it is difficult to tell which of them has to date suffered most through it.

There is this notable difference, however, between the employer disciplined by the Act and the workmen disciplined by the Act that the employer is submissive. It is the law, and he accordingly obeys it. The minority of workmen—for they are only a minority—who

object do not care whether the compulsion is exercised under an Act of Parliament or under an agreement with an employers' federation or association. Left to themselves they might do many of the things which they incline to refuse to do. The minute, however, the same things were made obligatory by a shells and fuses agreement, a Treasury agreement, or an agreement with their employers they would be sure to object. They dislike to be compelled to do anything. Their Trade Unionism, instead of disciplining them, has made them less tractable than ever. They realise that with more work than there are men to do it they are for the moment "top dog," and in their undisciplined, unthinking way they are inclined to make the most of their advantage.

Their leaders might, it may be said, bring them into a more reasonable frame of mind. At most of their leaders, however, they snap their fingers. Leaders who endeavour to compel them to do anything invariably suffer for it. Their leaders have, however, blown hot and cold on the subject of the Act, and because they have are not to be adjudged altogether blameless for the ferment of discontent which exists. Here, for example, is a recent allusion by Mr. Hill, the General Secretary of the Boilermakers' Society :—

"The Government has put power in the hands of employers to refuse permission to workmen to leave them in the usual way. Employers may also demand from their workmen not only full time service, but overtime on any day (including Sunday), with the threat of the Munitions Tribunal should they refuse. Some employers forget that we temporarily suspended our rights in the national interest and for the safety and success of our sons and brothers in the trenches. That being so we are entitled to more considerate treatment than they are meting out to us."

As a member of the National Advisory Committee Mr. Hill must accept some responsibility for that, because the Henderson Committee had a good deal to do with the framing of the Act. To suggest, however, that the employers are acting unfairly is simply to encourage the minority in their opposition—not only to the Act, but also to their employers. The effect of the allusion is just to make more "bad blood"—so to say. Mr. Wilkie, M.P., the General Secretary of the Shipconstructive and Shipwrights' Association, is not much happier in his allusions. He says in his most recently-published report that "employers in many places have taken arbitrary advantage under the Act," and also that the fines imposed by some of the tribunals have "been vindictive and out of all proportion to the offence committed." Mr. Wilkie alleges, moreover, that many of the decisions given by tribunals "are neither in accordance with the spirit of the Act or the intention of the same when it was placed on the Statute Book."

Other representative Labour men talk and write about the Act in much the same way. What they say is not, of course, the whole cause of the current opposition to the Act, but if it is not a contributory cause it can hardly be regarded as helpful. The fact which should be dinned into every workman's ears is that the Munitions Act is a war measure—not legislation which is intended to be applicable to normal conditions. We are all temporarily sacrificing something in these days, and to submit himself for the period of the war to the discipline of the Munitions Act—not, as seems to be believed, to the discipline of employers—is surely not a great deal to expect the workman to do.

THE ACTIVE TYPE OF GYRO-STABILISER FOR SHIPS.

A paper entitled "Recent Progress with the Active Type of Gyro-Stabiliser for Ships" was read at the 23rd General Meeting of the Society of Naval Architects and Marine Engineers held in New York on November 18 and 19 by Mr. Elmer A. Sperry whose name is prominently associated with the development of this type of apparatus. The paper describes experiments made on board ships of the United States Navy with the active type of gyro-stabiliser and they bring up to date the information resulting from these investigations. Among these have been determination of the exact amount of the true wave increment the gyros are required to neutralise involving the relation of the gyro quenching increment to the natural extension curve of roll of the ship. The latest experiments have been undertaken to determine the relation of the ship to the gyro. There is no variation from the rule previously framed, namely the gyro moment of stabiliser equipment for ships varies directly as the characteristic of the ship, *i.e.* the product of the displacement, the metacentric type and period of roll involved in the fact that it has been definitely ascertained that small boat require relatively larger moments or geater stabilising power than is the case with larger ships.

This means that waves of given magnitude belabour small ships more than they do large ones, which is to be expected, and therefore require relatively more roll-quenching power to be fitted. Again, it is possible to adjust the plant in other ways to meet special conditions such, for instance, as limited space, met with in the case of submarines ; limited weight, which is the case where the gyro is placed on deck, as in the motor yacht *Widgeon*, and which is also the case with submarines ; then again the condition where a limited power supply is available for spinning the gyro or gyros and handling the equipment.

Inasmuch as the roll-quenching power of the gyroscope varies as the square of its diameter and only directly as its speed and weight, and inasmuch as another factor, *i.e.* the power required for spin at the higher rates, varies almost directly as the cube of the peripheral velocity it will at once be seen that where ample space is available and the matter of weight is not critical the rotor and spread bearings may be so adjusted as to require a minimum of power for maintaining the spin of the wheel for a maximum of gyroscopic moment ; and *vice versa* where only a limited space and weight are permissible and an abundance of power available, a small gyro spinning at higher velocity may be utilised for developing comparatively large stabilising moments.

As is characteristic of Western enterprises, it has come to pass that the first commercial gyroscope stabilising equipment to be installed has been placed upon the yacht *Widgeon* plying on the Great Lakes. This was placed in service in the autumn of 1915, and is of the full active type. The characteristics of the *Widgeon*, after some investigation, were determined to be as follows :—

Displacement	165 tons.
Metacentric height	1·75 ft.
Period of roll, over and back	4·75 sec.
Water line length	120 ft.
,, ,, beam	18 ft. 2 in.
Total submerged amidship section	80 sq. ft.

For this ship a gyro was selected giving a K^2W 2,700 lb./ft.^{2}, 2,750 r.p.m., roll-quenching power per increment, 5 deg., the gyro rotor, shaft and armature weighing 2,150 lb.

The space selected as best suitable under all conditions for the location of the plant was on deck just abaft the stack, where it has been surrounded by a cabin-like housing, conforming with the superstructure of the yacht, provided with windows permitting full observation of all of the movements and oscillations of the gyro, which are known to be more or less unusual and interesting in character. The total weight of the equipment is about 1 per cent. of the displacement.

This yacht was looked upon as being a very free roller, and has been reported to have rolled through an arc of 70 deg. or thereabouts. The gyroscopic roll recorder afterwards employed in this ship showed, however, that the estimate of roll from the ship's clinometer may have exaggerated this arc to some extent. After installation it was found that when the gyro was thrown "off" a free roll of from 24 to 40 deg. of total arc was quickly developed while running in the trough of the sea, and when the gyro was thrown "on" this was quickly reduced and held at 2 or 3 deg.

From the characteristics of the Worden the position selected and the gear that a little gasoline electric generator installed for the purpose was available for driving the gyro, a wheel of 3 ft. diam. by 10 in. face was adopted as the one best suited to the conditions. This wheel is run at very low rim stress, giving a very large factor of safety, the maximum stress being about 12,000 lb. The current supply being direct current, a direct current motor was constructed specially as a part of the rotor shaft.

It is interesting to note how small a motor is really required to maintain such a wheel as this at a speed of about 2,750 r.p.m., this motor having run the wheel repeatedly to 3,500 for over-stressing and test purposes, the motor shown in the cut being in excess of the actual spinning requirements by fully 300 per cent. for quickly energising the mass in getting up to speed.

At the ends of the shaft are located the main bearings which, though specially made, are the ordinary annular ball type, ample provision being made for taking care of the end thrust. In each end of the casing there are oil wells and a little slowly rotating oil pump which circulates the oil upwardly through the coolers, a strainer and back over the top of the bearings, thus insuring both ample lubrication and cooling of the bearings. The temperature difference between the incoming and outgoing oil is just noticeable when the gyro is doing full duty in heavy weather, this temperature practically equalising when the gyro is not precessing.

It is interesting to note that while the radial load on these bearings varies between practically zero and about six tons, the power varies only slightly—one observation showed a change of from 35 to 40 amperes only between these two conditions. This indicates that the power consumption is due in small degree only to the bearings, be they loaded or otherwise, but largely to windage, which is constant for constant speed, which was maintained in these tests.

The system of control is practically identical with that which was finally adopted in the last experiments on the *Worden*, that is, a small auxiliary gyro is employed to feel out the incipient rolling of the ship by closing small electrical contacts plainly to be seen, as soon as the ship rolls very slightly one way or the other. These contacts are required to handle only a very few watts, in fact about one-quarter of the energy of an ordinary incandescent lamp, and through a relay switch serve to actuate a small reversing motor which constitutes the precession motor. This motor precesses the gyro upon its main supporting gudgeons at the ends of the frame; it is here that the gyro lays hold upon the ship to control its movements.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by Correspondents.]

THE CORRUGATED SHIP.

5, St. Nicholas Buildings,
Newcastle-on-Tyne,
November 30.

TO THE EDITOR OF SHIPBUILDING AND SHIPPING RECORD.

Referring to the editorial article in your issue of November 25, page 459, with respect to the "Monitor Corrugated Ship," I quite agree with your concluding remarks that the greater adoption of this system of construction will be insisted upon by shipowners who wish to make money.

With respect to your reference to the question of the Caws Experimental Tank *versus* the Froude Tank System, I think it is entirely out of place to say anything about that in your paper, so far as I am concerned, because I take it the very great success of the monitor corrugated ship will shortly compel investigation by competent scientific authorities to show why the Froude Tank did not give the result equal to what the ships did in actual working at sea, whereas the Caws Tank did give the exact result and therefore encouraged and enabled this system to be carried through.

Consequently I take it that your readers, shipbuilders as well as shipowners, are mainly interested in the practical questions of construction of ships, economic working thereof, and financial results of their trading.

With respect to construction, the advantages of same are sufficiently demonstrated by the fact of the strength of the ships' sides, both longitudinally and laterally, being greater than the plain ships, and the consequent increased frame spacing granted by the classification societies.

With respect to the shipowners as such, I will simply first quote the following figures from the Ericsson Shipping Company, Ltd.'s, balance sheets as regards their steamers *Monitoria* and *Hyltonia* The *Monitoria* was built in 1909 to demonstrate the advantages of the monitor corrugated construction, carried during her first year, ending September 30, 1910, extra deadweight over 17 trips 1,951 tons, with a saving in bunker coal of 470 tons, being extra cargo of 2,421 tons, as compared with her sister ships of exactly same dimensions, built by the same builders, with similar engines but ordinary plain ships.

Taking the average freight earned by the ss. *Monitoria* during that year the above figures represent an increased earning of £820, together with a saving in coal of £235, making a total advantage in favour of the monitor corrugated type of £1,055 during one of the worst years known to shipping.

The ss. *Hyltonia* was built in 1911, and the result of the trading of the two steamers for the 12 months ending September 30, 1912, so far as the monitor corrugated construction was concerned, was an advantage of £1,240 for the *Hyltonia*, and £1,130 for the *Monitoria*, upon the above basis of extra cargo and saving of bunker coal, as compared with plain ships.

Secondly, Furness, Withy & Co., Ltd., have had both these steamers under time charter in order to compare the results with four of their steamers, of which the *Monitoria* and *Hyltonia* were in every way duplicates, apart from their corrugated construction.

Their experience confirms the facts and figures I have given you above. They have built one monitor corrugated ship themselves, and Norwegian owners have built six, and there are three building of about 5,500 tons each for English owners.

I think I need say no more, as the figures and the orders for new ships speak for themselves.

ARTHUR H. HAVER.

[What we said in our concluding remarks was "It may be, as he suggests, that shipowners are very conservative and are slow to adopt new ideas which offer undoubted advantages, but the wider adoption of his system, which he hopes for, will undoubtedly come if the advantages which he claims for the corrugated ship are shown by definite results to be real and convincing." There was nothing at all in the article referred to which could be construed into meaning that "the greater adoption of this system of construction will be insisted upon by shipowners who wish to make money." Mr. Haver has thrown over the Froude system because the results obtained thereby do not bear out his contentions. Consequently one would expect more definite rebutting arguments than an airy comparison with anonymous "sister ships."—ED. *S. & S.R.*]

LOCATION OF THE WHISTLE.

Chalfont, Madeley Road,
Ealing, W.
November 23.

TO THE EDITOR OF SHIPBUILDING AND SHIPPING RECORD.

With reference to the note which appeared in the "Record" for November 11 upon the location of the whistle, I believe I am right in saying that the *Vaterland* has, or had, one fixed right in the bows.

I saw her when she was in the Solent in 1914, on her maiden trip, and I have a distinct recollection of her answering the salutes of other vessels from a whistle situated right in the extreme bow.

H. EDGAR PARKER.

THE APPLICATION OF SMALL STEAM TURBINES FOR AUXILIARY PURPOSES ON BOARD SHIP.*

In the early stages of development of the land turbine the possibilities of the small turbine for auxiliary drive, &c., were almost entirely overlooked, due to the concentration of energy towards the perfecting of the larger machine. The small turbine, of course, had to come and is now a well-established, and in fact a standard, prime mover for the great majority of auxiliary apparatus.

In marine work we have seen the gradual elimination of the reciprocating engine for practically all classes of work by the turbine, land practice is repeating itself here, and the possibilities of a small turbine for auxiliaries on board ship are now demanding attention of all marine engineers.

It is interesting to note in passing that while the small turbine is considered a comparatively new innovation here, the earliest turbines built by Sir Charles Parsons were used for lighting purposes on board ship. In fact, the majority of the first machines built were used for this work. The small weight due to the high speed permissible in the generators at that time appealed to the Government and private shipbuilders alike, and having made such a good start it is rather surprising that this application did not become more universal.

The turbo-generator has become practically the standard unit for electrical production in all navies and merchant marine, so that little need be said about this application at the present time.

The small turbine is now successfully employed for the following purposes :—

1. Generator sets.
2. Wireless sets.
3. Forced draught blowers.
4. Circulating pumps.
5. Hot well pumps.
6. Ash ejectors.
7. Induced draught fans.
8. Ballast and service pumps.

The three new battleships, the *Arizona*, *Mississippi* and *Idaho*, are being equipped with turbine auxiliaries as follows :—

Type.	*Arizona.*						*Mississippi.*					*Idaho.*				
	No.	Steam press.	Back press.	Speed R.P.M.	B.H.P.	D. C. or geared.	No.	Steam press.	Back press.	Speed R.P.M.	B.H.P.	D. C. or geared.	No.	Steam press.	Back press.	Speed R.P.M.	B.H.P.	D. C. or geared.
		lb.	lb.					lb.	lb.					lb.	lb.			
Dynamo condenser pumps ...		—			—		2	295	26	1,275	15·8	D. C.	2	200	26	1,275	14·1	D. C.
Boiler feed pumps	2	250	15	3,000	180	D. C.	3	295	15	3,000	144	D. C.	3	230	15	3,000	174	D. C.
Forced draught fans	12	250	15	1,550	32	D. C.	—	—		—	—		9	250	10	1,550	46	D. C.
Main circulating pumps ..		—		-	—		2	265	20	3,620 / 850	460	Geared	2	230	5	1,350	347	D. C.
Distiller circulating pumps ..	—	—	—			..	2	295	8	2,000	13·2	D. C.	2	250	8	2,000	12	D. C.

Forced Draught Fans.

Apart from generator sets the first serious application in the United States Navy of the small turbine was forced draught sets on torpedo-boat destroyers. The great importance of the successful and continual operation of this apparatus, the serious losses that had been sustained by the breaking down of engine-driven fans on trial trips and in service made the Government and shipbuilders seriously consider the possibilities of some other form of drive that would be more reliable. Motor drive was impracticable, and the steam turbine, therefore, presented the only feasible solution provided a machine could be designed giving a reasonable economy with a mechanical design that would insure absolute reliability. The economy proved satisfactory. The next step was the satisfactory mechanical design.

The first design submitted to the Navy Department by the writers for a forced-draught unit was a horizontal turbine, geared to vertical fan shaft, thus permitting the use of standard type of turbine running at high speed with resulting good water rate. However, the Bureau preferred to sacrifice economy for reliability, and requested that the design be modified to a direct connected vertical shaft unit, thus cutting down the weight and removing possible trouble at the gear.

This led to the design and adoption of the Terry type BV which for many years has been standard in the United States Navy.

As in all other turbine development work since the very first the trouble was not at all serious as far as the turbine itself was concerned, but in the design of a satisfactory driven member.

At the time of which we are writing, there was no fan developed for turbine speeds to give the required volume (23,000 cubic ft. per min.) at the low head necessary of only 5 in. with an open type of fan, the cased type being prohibitive. Also, the screw type of fan could not be considered on account of the noise. Several fan-makers tackled the problem and did not appreciate what they were up against, and it is interesting to note the lack of knowledge that existed in this branch of engineering at that time. The first fan was guaranteed on paper to run at 2,500 r.p.m. and require a horse-power of 30. After several very disheartening attempts at procuring a reliable fan, a successful fan was finally built, but the speed had by this time been dropped to 1,700 and the horse-power had gone up to 60.

The efficiency of the first fan was in the neighbourhood of 25 per cent. By careful study and experimental work by the fan-builders, this has been increased to 50 per cent. at the present day.

The main difficulties lay in the design of a low-head fan without casing. In other words, the old turbine propeller problem was again present. The fan, of course, had to be of the single-inlet type and the area of inlet large enough to pass the required volume of air with the pressure governing the tip speed, and in turn limiting the revolutions per minute of the turbine.

One other great difficulty encountered in the early days was the true determination of the performance of the fan. With the exception of Captain Taylor's experiments and apparatus for testing fans standardised by him, little had been done in research work to determine the performance of fans of this kind. To carry out Taylor tests was an expensive operation at best, and the figures given by the fan-makers were more or less guesswork based on the more elementary apparatus necessary for cased fans, which (as has later been found out) was in no way applicable to the determination of the performance of open-type fans.

The adoption of Terry-driven units for destroyers was about coincident with the use of fuel oil under the boilers, and the correct amount of air required for the oil fuel in torpedo-boat service had not as yet been definitely determined.

Very careful tests were laid out and conducted by Mr. Charles F. Bailey, Chief Engineer of Newport News Shipbuilding & Dry Dock

* Abstract of a paper read by Mr. W. J. A. London and Mr. Frederick D. Herbert, Members, at the 23rd General Meeting of the Society of Naval Architects and Marine Engineers, held in New York, November 18 and 19.

the U.S.S. *Lloyd*, on April 14, 1910. On the test two fans delivered 1,400 cubic ft. of air per min. to one boiler room, at an average speed of 1,361 r.p.m. and 3.2 in. static pressure in the uptakes. The fuel oil used per hour 2,000 lbs., total water evaporated, 102,500 lb. per hour.

Since that time the capacity and air pressure have gone up with the increased horse-power of the new destroyers, so now the standard for destroyers Nos. 69 to 74 is 32,000 cubic ft. per min. against 6 in. air pressure. This has been obtained without increasing the diameter of ventilators, but by improvement in turbine and fan efficiency, so that the total steam of the latest design is practically the same as required on the *Roe*.

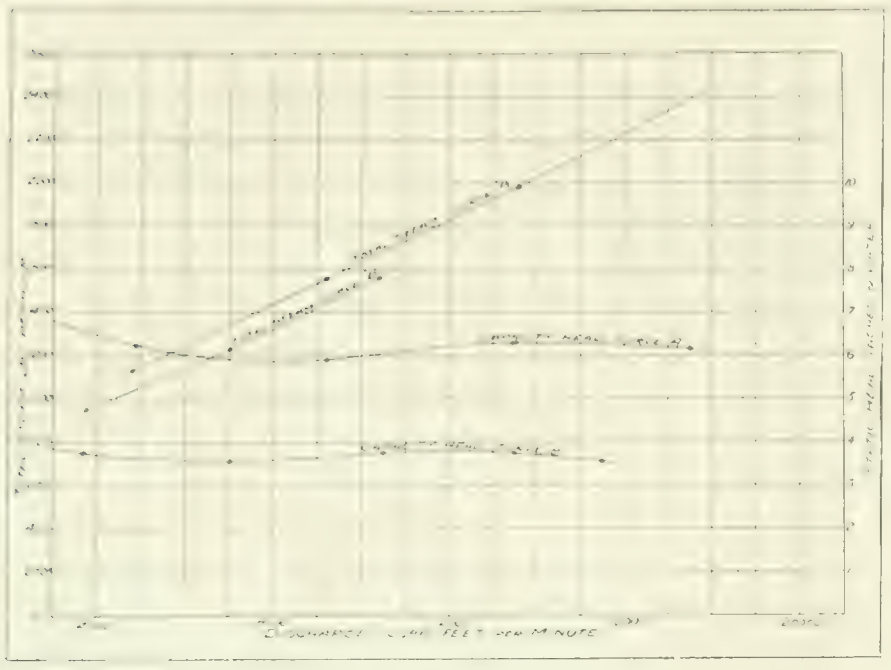

Fig. 1.—Capacity and Total Steam Curves for Single-Inlet Open Fan.

The high static pressure in the stokehold and greater capacity have increased the peripheral speed of the fan to such an extent that now the type of fan selected is in part determined not only by its efficiency but by the noise it makes, as excessive noise, of course, is a tactical disadvantage to any destroyer. Furthermore, the first destroyers were fitted with mushroom-type ventilators, whereas the latest class has the cowl type, which forms a most excellent megaphone for projecting any stoke-hold noise.

Again, as capacities have gone up, the weight of fan has increased, and it is now generally conceded that the increased duty on the bearings when the destroyer is in a seaway, due to the gyroscopic action of the turbine unit, makes it desirable to limit the speed of these forced draught sets to about 1,600 r.p.m.

The type of fan has evolved from the original Sirocco to the cone type, and then back to the multiblade, with blades of such design as is found will result in quiet running. Whereas, originally on oil fuel for destroyer service, a ratio of 225 cubic ft. per lb. of oil to be evaporated, was considered to be correct, now 350 cubic ft. per lb. is standard.

This takes care of a greater dilution, coefficient and smokeless burning of the oil as well as leakages. Smokeless operation is one of the principal points on torpedo-boat manœuvres, and in order to accomplish this in many ships an excessive amount of air is forced into the boiler rooms, even at a sacrifice of fuel economy. Photographs of early destroyers taken on trial as compared with that of the *Ericsson* show a marked difference in this respect.

Little authentic information could be obtained at first from fan-builders as to the absolute and true performance of the fans, and therefore there was nothing left to do but to run comparative tests. In September, 1911, three different types of fans were tested out on a comparative basis. These tests were fully described in the Journal of the American Society of Naval Engineers, Vol. XXIV, No. 4.

The turbine-driven fan has proved so eminently satisfactory in destroyer work that the reciprocating engine is no longer considered. In all there are now 46 oil-burning destroyers with turbine driven forced-draught fans, each with four complete units. Out of this number the Terry Company have supplied 38, and to date we have only a record of two actual repairs necessary to the machines due to any defects whatever, not of course considering the wear and tear of bearings, &c. This successful application of the turbine fan to destroyers has resulted in an entire change of policy in battleship work and smaller boats, also in the mercantile marine. The motor-driven fan, so long considered the standard for battleship work, is making way for the turbine blower.

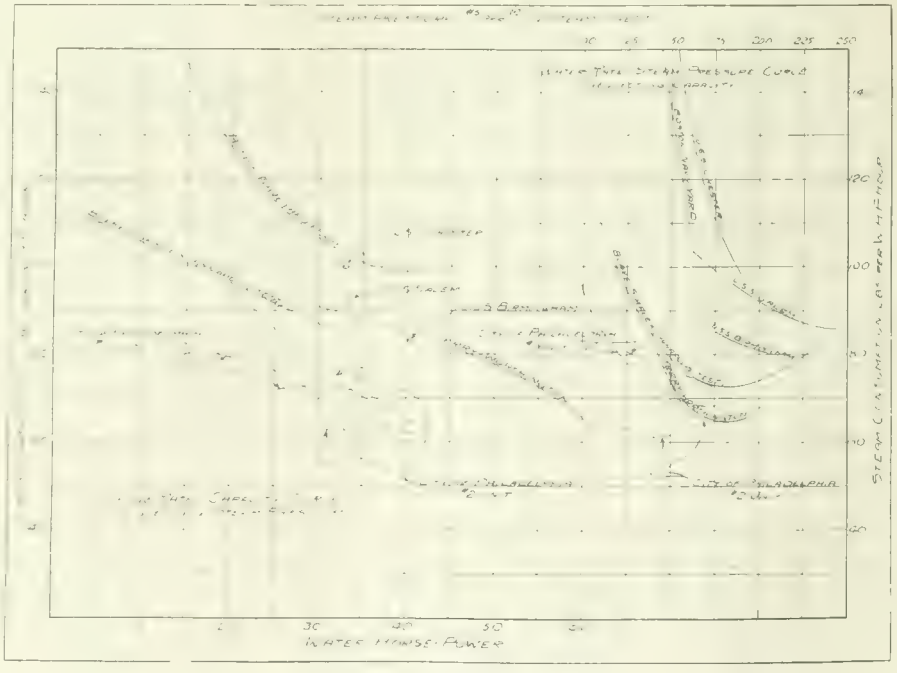

Fig. 2.—Results of Tests at Annapolis, November, 1912.

For battleship work the horizontal-turbine drive is now standard in the United States Navy, as replacing the motor-driven sets, because of their reliability, ease of control direct from the stokehold, and also that it is not dependent upon intermediary machinery—electric generators.

A higher efficiency can be maintained on the cased fan than on

the open type, and also the double inlet can be used, thus obtaining higher speeds for corresponding static pressures as compared with the single-inlet open fan.

Capacity and total steam curves of a recent unit of this type are given in Fig. 1. At a rating of 17,500 cubic ft. per min. and 6 in. static pressure the total steam consumed was 2,200 lb. per hour, exhausting against 5 lb. back pressure at 1,550 r.p.m.

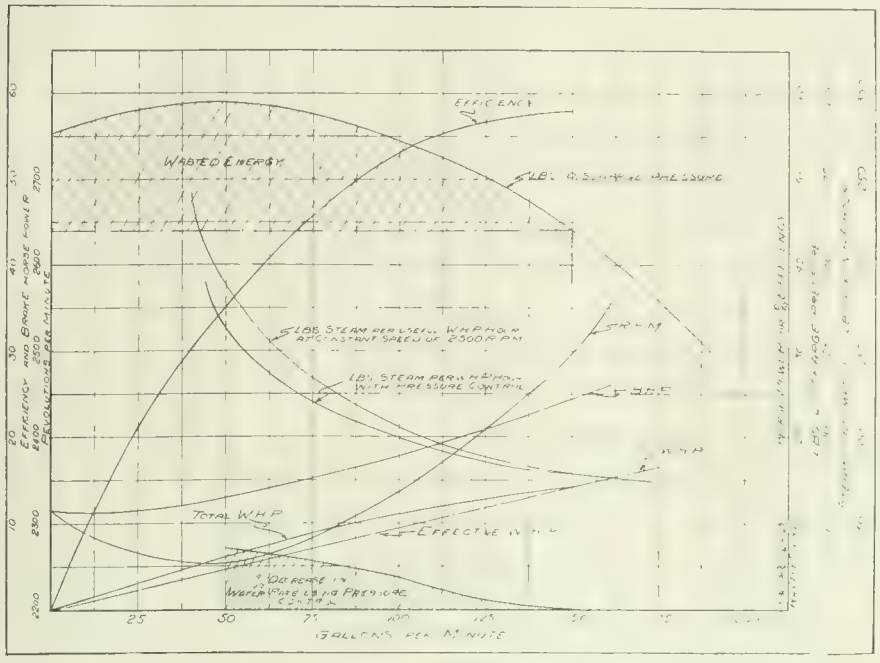

Fig. 3 —Curves showing Effect of Pressure Regulation on Total Water Consumption.

PUMPS.

The reliability demonstrated by six years of actual service with destroyer fans resulted in the Navy Department widening the application of the small turbine, and in 1911 specified turbine-driven centrifugal pumps, on the battleship *Arkansas*. A serious proposition at first presented itself here on the grounds of economy owing to the slow speed necessary for the pump and the limitations of weight and diameter of turbine wheel. However, this individual turbine efficiency is not of such prime importance as would be at first imagined, and (as will be explained later) that while the turbine itself could not at first be called an efficient machine operating under the conditions at which it does, the effect of the poor efficiency when considered in conjunction with the whole performance of the ship is of little if any importance.

For reasons that will be fully dealt with later and taken into consideration in conjunction with the reliability in service, it will be seen that the lack of unit efficiency is of minor importance. This is demonstrated by the fact that the latest boats have been or are being equipped with similar apparatus.

The advantages of the turbine-driven boiler feed pump have long been well known to the marine profession, but certain difficulties in their installation presented themselves, necessitating, as it was considered, special designs to suit shipboard requirements. This, together with the satisfactory service given by any good make of reciprocating pump, resulted in rather slow progress along these lines.

However, in 1912, the Navy Department decided to run exhaustive tests on a unit specially designed for their work. The turbine was built by the Terry Steam Turbine Company, and the pump by the Worthington Company, and tests conducted on this apparatus at Annapolis and were reported in the November, 1912, issue of the Journal of the American Society of Naval Engineers.

The results of the tests carried out at Annapolis are shown in curves (Fig. 2), compared with various tests on reciprocating types of pumps. These curves show up more favourably for the turbine driven unit than would be inferred from the quotations in the report.

That the tests were satisfactory, however, is demonstrated by the fact that turbine-driven boiler feed pumps are now being built for installation, as follows :—

One of the main advantages of the centrifugal boiler feed pumps is that they deliver a uniform pressure and volume at a given speed, eliminating entirely the vibration in the unit and piping caused by shock in reciprocating pumps. Furthermore, the pressure being kept constant, a much lower margin of pressure difference between the pump pressure and boiler pressure is obtained than with reciprocating pumps.

The ease with which a small turbine can be started up and the absence of danger due to water hammer has opened up a large field for the small turbine for ballast pumps on board passenger vessels. The necessity for making ship quickly on this type of boat is of the utmost importance. The ballast pumps on board the *Hendrick Hudson* were guaranteed to start from rest and be under full load in 60 seconds. Actual tests showed that this duty could be accomplished inside of 30 seconds without danger to any part of the machine or piping.

For boiler-feed pump purposes the advantage of regulating the operation of the pump by the pressure at the discharge has obvious advantages. The majority of pumps installed for boiler-feed purposes in central stations now

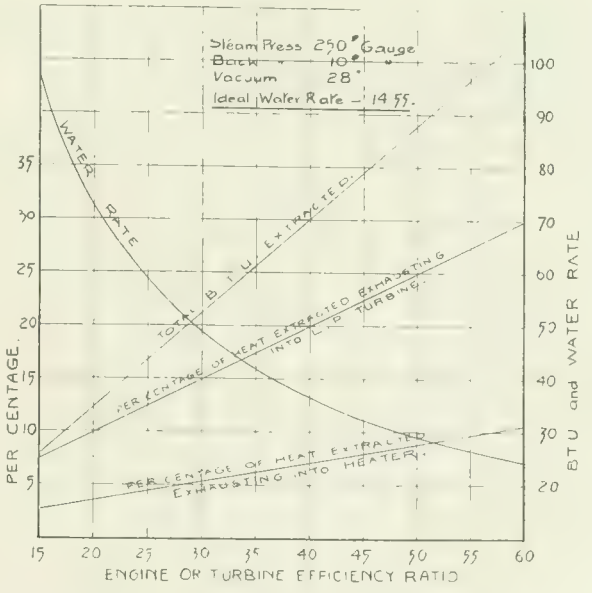

Fig. 4.—Curves showing Water Rate and Heat Extracted per Pound of Steam with Varying Efficiency Ratios.

are fitted with some type of pressure regulator with the main speed governor so adjusted that it acts merely as an emergency governor. Considerable saving in steam consumption can be effected by the adoption of a pressure regulator, as will be seen by curves attached herewith (Fig. 3) showing the effect of pressure regulation on the total water consumption. This is particularly applicable to marine work where the demand on the boilers is a constantly varying quantity during manœuvres.

In addition to the use of turbine-driven main condenser and feed and ballast pumps the small turbine is being quite generally used for driving auxiliary pumps on vessels of large power. In this class of work there is very little difference in the marine application from that of similar use on land.

Turbine-driven ash ejector pumps have been supplied to many ships by J. Stone & Co., of London, for both merchant and war vessels, but in this country, as far as the writers know, the only turbine ash ejectors are on the older battleships and two others. The turbine is eminently satisfactory in this service, as steam can be turned on without warming up and full delivery head obtained almost instantly.

Turbines can also be effectively used on bilge pumps. Other applications are for auxiliary condenser, sanitary service, fire and ballast pumps.

this, however, later designs have been fitted with only two bearings with a very stiff, hollow shaft eliminating the necessity for this outer bearing.

For low and moderate speeds, such as that required for pumps, horizontal fan sets, &c., standard ring oil bearings have proven perfectly satisfactory. In land practice it is considered that for ring oil bearings a PV (pressure in lb. per sq. in. times rubbing velocity in ft. per sec.) of 450 or 500 is perfectly safe. In marine work, however, a considerably lower limit should be used, especially in small boats, owing to the rocking of the vessel and the uncertainty of a uniform supply of oil being delivered by the rings. It is therefore becoming universal practice to supply all such apparatus as generator sets with their own forced feed system. It is advisable to still retain the oil rings (in addition to provision for forced lubrication) for starting up and as a safeguard against accident to the oil pump.

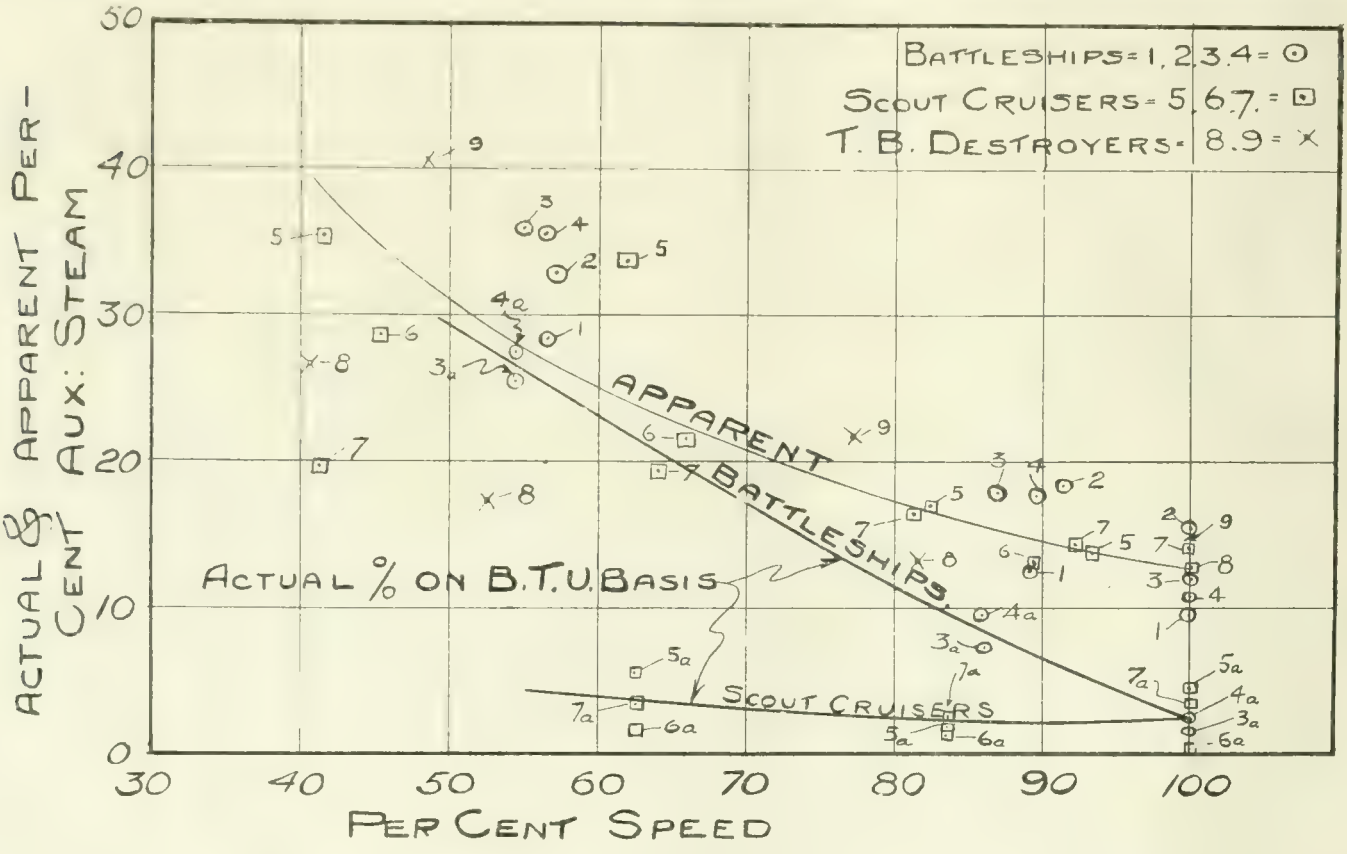

Fig. 5.—Curves showing Quantity of Auxiliary Steam used at Various Speeds in Percentage of Total.

Detail Design of Small Turbines.

It is only natural to expect that small turbines as designed for land work need certain modifications to conform with marine practice. However, in the large majority of cases, as, for instance, where comparatively low speeds are required, practically no modifications, or at most very slight modifications, are required from standard stationary practice.

For forced-draught fan sets on board torpedo-boat destroyers a special vertical design of machine had to be developed for this work. The first design accepted by the Bureau, and which has been standard up to a year or two ago, consisted of a three-bearing unit, a steady bearing being considered necessary at the outboard end of the fan, or, in other words, secured to the intake duct. As this steady bearing could not conveniently be made integral with the main turbine frame and had to be supported from the light steel-work composing the intake duct, a certain amount of difficulty was experienced in keeping this machine in line. This difficulty, however, has not been as serious as would be at first imagined, and some builders still favour this arrangement. In order to overcome

The glands or stuffing boxes of small turbines should be of such a type as to require absolutely no lubrication, in order to eliminate any necessity for oil or grease separation in the feed-water heater. In all small turbine work the critical speed of the rotor should be well in excess of the maximum running speed. This point is of more than particular importance in marine work where units are required to run through a large variation of speed.

Efficiency.

As mentioned earlier in the paper regarding the poor unit economy of such apparatus as the Arkansas circulating pump, it must be borne in mind that when operating auxiliaries non-condensing and utilising the exhaust steam either in the feed-water heater or in the low-pressure main turbine, a big sacrifice can be made in the auxiliary efficiency without materially affecting the over-all fuel consumption of the whole ship. When a small turbine operates with an efficiency of 30 or 40 per cent. you are only extracting this said 30 or 40 per cent. from the steam. The consequence is, the remaining heat—namely, 70 and 60 per cent. respectively—is not destroyed, but can be utilised to good advantage elsewhere. Curves

(Fig. 4) show the heat extracted per lb. of steam by an auxiliary turbine, and also show that a very big difference in steam consumption per horse-power is permissible without materially affecting the efficiency of the whole cycle.

On curve, Fig. 5, is plotted the quantity of auxiliary steam used at various speeds in percentage of the total. In the curve the 100 per cent. speed represents the maximum speed on trial trips.

It was interesting to note that, after plotting the curve, the percentage of auxiliary steam could be closely approximated by the following formulæ :—

$$A = \frac{1300 + \frac{100 - S}{0{\cdot}2}}{S}$$

where A = percentage of auxiliary steam to total steam.

S = percentage of maximum speed of the boat.

The following calculations will show the very small effect actually resulting in a marked improvement in the steam consumption of a piece of auxiliary apparatus. These calculations are not intended to be accepted as absolute figures, but will tend to serve the purpose intended, namely, to show that the unit of economy of the auxiliary apparatus is not of such vital importance as would be at first imagined.

It has been necessary at the outset to make certain assumptions, and the type of apparatus used in the one instance is a direct-connected low-speed turbine circulating pump, the second case being a gear-driven unit. It has also been assumed that all the steam exhausting from the turbine can be returned to work in the feed-water heater. This, of course, is subject to criticism, but, as mentioned above, the figures are not intended to be absolute but merely an indication of the difference that is to be expected between a high-efficiency and a low-efficiency unit.

One very strong point that this question brings out is the fact that it is not in the turbine itself where we must look for efficiency, but in the driven end of the apparatus. Within reasonable limits the efficiency of the turbine matters little in the over-all fuel cost, as the heat rejected can be turned to useful work, but in the driven member anything below 100 per cent. efficiency must be considered as a dead loss.

	Direct Connected.	Geared.
1. Horse-power	347	340
2. Efficiency ratio	0·25	·47
3. R.P.M.	1,350	3,620
4. Ideal water rate (250 — 10 lb.)	14·55	14·55
5. Actual water rate (lb. per b.h.p. hour)	58·2	31
6. Total steam per hour = (1) · (5) ...	20,195·4	10,540
7. Total heat per lb. at 250 lb. pressure ...	1,199·2	1,199·2
8. Heat in exhaust with 100 per cent. efficiency	1,024·4	1,024·4
9. Available heat = (7) — (8)...	174·8	174·8
10. Actual heat used = (9) × (2)	43·700	82·156
11. Heat required per lb. to be generated to run circulating pumps = (7) — (head of liquid of exhaust)	991·2	991·2
12. Total heat requisite to run circulating pumps = (6) × (11)	20,017,680·48	10,447,248·0
13. Total heat returned to system per lb. steam = (7) — (10) + 208·6 ...	946·9	908·444
14. Total heat returned to heater = (6) × (13)	19,123,024·26	9,575,590·0
15. Total heat chargeable to circulating pumps = (12) — (14)	894,656·22	871,658·0
16. Same as (15) for two turbines = (15) × 2	1,789,312·44	1,743,316·0
17. Total steam required for remaining apparatus (lb. per hour)	600,000	600,000
18. Total heat required for remaining apparatus = (17) × (7) — 70... ...	677,520,000·0	677,520,000·0
19. Saving by using gears (16 Col. 1) — (16 Col. 2)	—	45,996·44
20. Total heat for all purposes = (18) + (16)	679,309,312·44	679,263,316·0
21. Per cent. saving $\frac{(19) \times 100}{(20 \text{ Col. } 1)}$		·00677

To improve the unit efficiency of various parts of the apparatus, gears are being resorted to.

Regarding the advantage of gear-driven auxiliaries, it is true the unit efficiency is improved, and granted that remarkable developments have been made in recent years towards the production of a satisfactory gear, it is nevertheless a fact that the gear-box considered as a unit is another piece of apparatus to take care of, and the writer's experience has been that this piece of apparatus is still far from perfect. Of course there are good gears, but the successful operation apparently depends so much on perfect workmanship that there seems to exist a big element of chance as to whether a gear will or will not be satisfactory, or if initially satisfactory, will stay so.

The noise created by an imperfect gear in the confined spaces on board ship must necessarily be more disagreeable than in a large power-house, and the above, taken into consideration with the really small saving in the over-all economy as pointed out later, leaves the writers very sceptical as to the net advantages.

Two of the sister battleships now building, the *Idaho* and the *Mississippi*, are equipped with direct-connected and geared circulating pumps respectively, and some very interesting comparative results should be forthcoming. Also the comparative cost of upkeep after 12 months of operation will undoubtedly throw very valuable light on this subject.

Another innovation was made by Mr. Wetherbee, of the Bath Iron Works, to reduce the unit steam consumption on the blower turbines, viz., by arranging the turbine blowers so that they could be operated either singly or in parallel. For running at full speed the blowers are operated as single units, and at cruising speed they are operated in series. A very marked improvement in economy has resulted from this combination.

One point it might be well to bring out here when considering the question of efficiency, and that is the ease at which the total steam passed by a turbine auxiliary can be quickly and accurately measured without the aid of any measuring tanks, &c., and it appears to us that this should be extremely useful on trial trip work.

Practically all small turbines expand the steam in the intitial jets to a point below the critical velocity, so that Napier's formula for the flow of steam through jets will give results as accurate and probably more so than any weighing or measuring method. All that is necessary is an accurate gauge placed right in the steam ring and a record taken of the dimensions of the throats of the jets. It will be found that all makers of small turbines are very particular about the design, shape and dimensions of the jets being made to accurate plug gauges so that the dimensions of the jets can be relied upon with certainty. Napier's formula reads—

$$W \quad \frac{PA}{70}$$

where W = weight of steam per second.

P = absolute pressure before the jets in pounds per square inch.

A = the area of the jets in square inches.

From actual experience it has been found that for the majority of small turbine work and the small jets that are necessary for the expansion of high-pressure steam, a coefficient of 72 is more accurate than 70, and this in turn simplifies the formula given for the flow of steam per hour as follows :—$W_1 = 50$ PA, where W_1 in this case equals the pounds of steam per hour.

Superheat.

The increasing use of superheat in power-houses has to a large extent been responsible for the growing popularity of the small turbine for auxiliary drive with the attendant elimination of internal lubrication, &c., and the same advantages in favour of the turbine naturally present themselves in marine work with the ever-increasing operating temperature.

A particularly interesting investigation was made some time ago by Captain Clarence A. Carr on "American Practice in Using Superheated Steam," and the advantages of the turbine-driven auxiliary under high temperatures was repeatedly advocated by the different authorities quoted.

In conclusion, we would like to bring out the point that the successful application of the small turbine for marine work is due

to a large extent to the co-operation and suggestions made by the Navy Department and marine engineers of long experience, and their co-operation and help in all probable agents in anything new, so that experimental naval work, has made the present situation possible.

The Navy Department has always listened to any suggestions regarding modifications of specifications which experience has found desirable in this class of work. The marine engineers and naval architects of the different shipyards have also added very materially to the development of this field by their valuable suggestions from time to time, and it is to these gentlemen we wish to extend our thanks as representatives of turbine manufacturers for the successful status of the present day of the small steam turbine in marine work.

THE UTILITY OF THE WM. FROUDE TANK.

The considerable interest attaching to the paper read by Mr. G. S. Baker, Superintendent of the William Froude National Tank, to the members of the North-East Coast Institution of Engineers and Shipbuilders at Newcastle last Friday, was shown by the largeness of the audience and by the character of the discussion.

Mr. Baker supplemented his paper by a short lecture illustrated by lantern slides. He stated that one of his objects was to bring home to his audience the value of such a tank, not to the scientist but to the practical man. As the result of two years' work in testing models in a country turning out millions of tons of shipping every year, there were found to be only nine firms in this country which, not possessing tanks themselves, had been progressive enough to have their boats tested in order to see what was the best they could do. He gave details of the results of these tests and stated that horse-power economies of from 4 to 42 per cent. had been effected by the tank tests. In each case, the work was completed for a fee of less than £200 and the return to the shipowner varied from 300 to about 3,000 per cent. per annum on the outlay on experiment. It had happened, not in one case but in many cases, that British shipbuilders had come to them to find out why, certain boats having been built, these boats were failures. That was very foolish. It would have been wise to have come before the ships were built. They had had, also, several firms come to them and say, "We want to know the horse-power of this boat," and the firms did not seem to be particular whether the boat was good, bad or indifferent. That was not the attitude of the progressive man. The progressive man was willing to take advantage of anything which would enable him to beat his neighbour in fair competition. The Institution secretary (Mr. Fraser Smith) had told the speaker that there was some thought of a tank for the North-East Coast. It took the Institute of Naval Architects 14 years to build the National Tank, and then it had to be done by the generosity of one man. He wondered how long it would take the North-East Coast to think of building a tank to enable the district to keep its place in front of its competitors.

Notes on Model Experiments.

The work dealt with in the paper is separated under three headings: skin friction resistance, strut and bilge keel resistance, and the effect of hollow and straight ends. In the first section a new analysis of the previous work is given, together with the results of further experiments on friction, and the skin friction resistance for all lengths of planks is reduced to a simple form and plotted as a single curve from which ship frictional resistance can be rapidly calculated. The effect of temperature upon the frictional resistance of a model is dealt with, an account is given of some experiments to determine the increase in resistance due to plate edges and butts, and the results are compared with W. and R. E. Froude's work. The second section deals mainly with the effect of size on strut resistance, and incidentally the applicability of model appendage experiments to the full-sized ship. It also deals with the effect of fore and aft position of bilge keel on its resistance.

The third section contains an analysis of a very complete set of experiments on hollow and straight lines, and shows the limits of usefulness of either form, and how these limits depend upon the prismatic coefficient and the speed.

It is a well-known fact that the greater portion of the power required for the propulsion of ships is used up in overcoming frictional resistance. W. Froude, after making a number of experiments on the frictional resistance of flat boards, gave a method of applying his results to lengths in excess of 50 ft., and to speeds in excess of his experimental speeds. Later, R. E. Froude (as a result of many experiments with models having shellac and paraffin surfaces) gave some new figures for the resistance of a varnished surface, which he extended to lengths greater than 50 ft. When running ship models at low speeds results have been occasionally obtained of which no explanation could be given. Under the same conditions and sometimes during the same experiment a model will occasionally require several different towing forces if the speed is sufficiently low. This phenomenon occurs in all tanks. The work detailed in this section was undertaken with the desire to get at the root of these troubles. Examining each series of experiments made by former experimenters it is apparent that at high speed-length values, each gives good results, but at low speed-length values the spots become divergent. Three model planks have been made and tried in order to obtain more data for this low speed part of the curve. The results at quite low speeds were remarkable, and the resistance fluctuated considerably.

In spite of the greatest care in experimenting these variations occurred, and the writer is of the opinion that this instability in the frictional resistance is the cause of the variation of resistance of tank models at low speeds, and of the large experimental errors found with models in a small tank when an attempt is made to obtain quantitative results. A limit is set to the speed-length value below which ship models should not be run if reliable results are to be obtained. At the higher speed-length values very definite results were obtained, and the testing of planks of length say 100 to 200 ft. are not considered necessary. The above experiments apply to a model or ship having a smooth varnish surface. But the surface of a ship is not smooth. It is broken up by plate edges and butts and experiments have been made with one model to determine the effect of these separately. The model chosen was a brass one which was assumed to represent a vessel of 400-ft. length, with raised and sunken strakes of plates. It was first tried with flush butts, the strakes running continuously from stem to stern. The increase in the wetted surface due to the thickness of the plate being exposed along the edge was from 1·5 to 2 per cent. The strakes were then broken and lap butts worked to give a reasonable "shift" over the bottom. The lap of the plate was always towards the stern. The increase in resistance shown by the experiments has been assumed to be wholly frictional, and the percentages given were worked out on the frictional and not the total resistance of the model. The increase due to plate edges only was 3·7 per cent. over the smooth surface resistance, and that due to plate edges and lap butts was 10·3 per cent. These percentages were constant over the whole speed range of the experiments. Calvert has shown in his experiments with a plank that the layer of water close to the plank rapidly acquires a considerable forward velocity. The resistance of any appendage on the surface of a ship must depend to some extent on this forward velocity of the frictional wake. This is true whether the appendage takes the form of extra roughness of surface or a bilge keel, so that the resistance due to lapped joints or a bilge keel may be affected by the longitudinal position on the ship. To determine the extent to which this might be the case, certain experiments were made. Pieces of calico were carefully stretched over two models at different points along the length. With one-eighth of the wetted surface at the fore end covered with calico, the total model resistance was increased by 11·3 per cent. The same extent of surface covered further aft produced much less

additional resistance. These results suggest (*a*) that the use of flush butts over about one-eighth the length of a ship at the fore end would lead to approximately 3 per cent. reduction of resistance, and (*b*) that bilge keels should be kept well aft on the form.

During the past three years experiments have been in progress at the tank to determine the effect of temperature upon resistance. Diverse experiments agree in showing about 3 per cent. reduction in resistance for 10° Fahr. rise in temperature. A careful analysis of some temperature differences for the tank show that the effect was always less at the highest velocity than at the low. The results, however, seem to justify the practices of correcting results to a standard temperature by an allowance the same as that given above.

Strut and bilge keel resistance.—On several occasions the tank has been asked to make experiments with shaft bossings and brackets, and such experiments have been made, although it was fully recognised at the time that there was some uncertainty as to how quantitative results could be obtained for the ship, from the model experiments. When only comparative tests of different forms were to be made, the small models would probably give about the same relative resistances as would be obtained with the full-sized appendages. But some experiments with a model in which strut resistance was abnormally great, made it imperative that this uncertainty should be cleared up if possible. For this purpose two sets of struts have been tested, one with a full section the other finer. The full form was tried in four sizes, the length in direction of motion being $\frac{3}{8}$ in., 2 in., 6 in., and 12 in. The fine form was tried in two sizes, the length in direction of motion being $1\frac{7}{8}$ in. and 12 in. The results obtained indicated that estimates from small models of struts as to the resistance of these full sized in a ship, are valueless. There can be little doubt that this remark holds good, not only for struts, but for shaft bossings and shafts as well. Estimating, from the results procured, the resistance of a strut arm 10 ft. long, 1 ft. long in the direction of motion, at a speed of 10 knots, the results obtained were as follows:—from the $\frac{3}{8}$ in. strut of the blunt form 486·5 lb., from the 2-in. strut 131·5 lb., from the 6-in. strut 74·7 lb., from the 12-in. strut 72 lb.

Straight and hollow lines.—Much has been written on the subject of straight and hollow lines during the last 20 years, and many attempts have been made to lay down a general law on the merits of these two types of lines. The author gives an analysis of some models made in the Froude tank. Due regard and attention has been paid to the experiments on the same general lines at the Washington and Haslar tanks. In 90 per cent. of vessels the lower levels are hollow towards the ends. In some this hollow is worked out some distance below the load waterline, and in the forebody all lines above this have a straight finish at the stem. This is what is usually meant by a straight line bow. When some of the hollow in the lower levels is retained up to the load water line it is called a hollow line bow. From the diagrams given in the paper it is shown that an acute hollow in bow lines is seldom advantageous, but that there is, for almost all fullnesses of ships a particular range of speeds in which a moderate hollow leads to reduction in resistance. As the fullness is increased, this range of speeds becomes more limited, and above and below these speeds straight lined ships are easier to drive. In general straight lines aft are preferable to hollow.

Discussion.

The President (Mr. Herbert Rowell) remarked that what impressed him was the great usefulness underlying the work which had been undertaken by Mr. Baker and his assistants and the use which practical men might make of it. That paper was a real treasury for technical people and ship designers.

Prof. J. J. Welch, of the Chair of Naval Architecture, Armstrong College, Newcastle, stated that he had been most interested in what Mr. Baker said as to skin friction. Mr. Baker had treated the matter in quite a different manner to that in which it was usually treated and the results as plotted went far to show that he was on the right lines. Mr. Baker's results seemed to indicate that there was not much chance of adopting, with success, very much smaller tanks than that with which he was connected. The question of the increase of frictional resistance due to the plate edges and lapped butts was new and important. It was interesting to note that, adopting lapped butts instead of flushed butts, one got an increase of frictional resistance of something like 7 per cent., which might mean 4 or 5 per cent. of the total resistance. On the subject of frictional resistance, some work had been done quite recently in the American tanks to show not so much that roughnesses were due to lapped butts as to fouling. Some plates were put in water and allowed to foul for different times, after which the resistances were measured. It was found that the resistance due to fouling for some 10 months was quadrupled in the case of these short lengths and although, of course, that proportionate increase was not likely to take place in the full-sized ships—because, the speaker took it, the effect of length in a full ship would be proportionately greater for the erosion surface than the smooth surfaces—yet that did show the importance of the work done by Mr. Baker on the point of smooth surfaces.

Mr. Baker intervened that, speaking from memory, he believed that there had been found to be an increase of 20 per cent. in the resistance of a ship which lay in the Tyne at Newcastle for seven months and was then tested.

As to the idea of a tank for the North-East Coast, Prof. Welch pointed out that there was a very good position available for such model experiments in the Jarrow Slake, if ways and means could be found for the work. He remembered that, at the inaugural meeting in connection with his professorship, he had the temerity to suggest that it might be possible to get a tank for that district. That was before the establishment of the William Froude Tank. He still lived in the hope of seeing such a tank installed.

Mr. Tennyson d'Eyncourt, Director of Naval Construction, wrote, stating that he considered the paper a most valuable contribution to the Institution's Transactions. It was a wonderful record of most valuable research work, and showed what a need there was for such a tank and how useful it had been to shipbuilders who had availed themselves of the facilities it offered. Since the war began, there had been an immense pressure of work at the Admiralty Tank at Gosport, and Mr. R. E. Froude had had more than enough work to occupy his whole time. The Admiralty, therefore, had occasion to ask Mr. Baker to carry out a considerable amount of investigation on various models and, in that way, it had been a great advantage to have the Teddington Tank at the disposal of the Admiralty, for the benefit of the country, in addition to the Haslar Tank. It appeared to the writer that Mr. A. F. Yarrow, the founder of the tank, should receive the congratulations of all interested in naval architecture upon the proved utility of the undertaking to which he had contributed so liberally and in which he had taken so great an interest. Mr. d'Eyncourt added that he wished he could have gone into detail on some of the points in Mr. Baker's paper, but there were only one or two points on which he was able to touch. It appeared that Mr. Baker's latest experiments generally bore out the earlier experiments carried out by W. Froude and others. The figures given for the increase in frictional resistance due to plate edges and lapped butts were most interesting. He was, however, inclined to think that, in practice, the percentage of increase given by Mr. Baker would be found to be higher than was really the case in actual ships. At one time, he (the writer) made some observations on that point and came to the conclusion that there was very little perceptible increase of power required. It would, however, be interesting to know if any more recent observations had been made on actual ships. His impression was that the difference was so small that it was almost impossible to obtain a value, as it was so difficult to get a true comparison between two ships otherwise similar, it being almost impossible

to [illegible] and deliveries in weather, performances of machinery [illegible] considerations such as how long a period had elapsed since each ship was docked and painted. The investigation for stern and bilge keel resistance was also very important, and he thought that often not enough attention was paid to the form of castings and forgings, especially at the after end of ships. There was no doubt that bad formation added greatly to the resistance.

Prof. T. B. Abell wrote stating that, in the short time he had had for studying Mr. Baker's most valuable study of the problem of skin friction resistance, he had, unfortunately, only arrived at the stage of inquisitiveness and thus could only, in the main, ask a few questions relating to the experiments which had added greatly to the information relating to the problem recently available. He noticed that in the experiments conducted upon the planks, several inches freeboard was given to the models. Mr. Baker, no doubt, could give some reason for his adopting what might be termed "surface" planks rather than submerged planks for the determination of a purely frictional and necessarily eddy resistance. The planks, he imagined, must form some surface disturbance whose effect it must be extremely difficult to eliminate from the purely frictional element of resistance. It appeared that, at any rate, a first approximation to that surface disturbance might be obtained by trying the planks at different draughts differing by a small amount. Perhaps some such method had actually been used before comparing the results with those of other experiments in which no wave or surface disturbance took place. He would like to ask what was the nature of the instability of the resistance at low speeds, and whether it was such as would be eliminated by using a dashpot on the resistance measuring apparatus or whether the plank resistance appeared to be steady at different and definite resistances. These appeared to him to be points of great interest and importance, which, if Mr. Baker would comment upon them, would increase the already great importance of his investigations. There was one suggestion he had to make, and that was that skin resistance due to the plate edges and lapped butts with the laps facing forward should be tried. If the motion around the surface was almost wholly eddy and not laminar, one would expect little difference in the two cases of butts facing forward and butts facing aft. Of course, there were some practical objections to them facing forward, but it would be valuable to know whether, if they faced forward, the resistance would be diminished, as might be expected if the motion was laminar.

Mr. W. Lovett, Bangor, County Down, Ireland, wrote remarking that, from the results given, it was evident that further research in the matter of strut and bilge keel resistance was necessary. The tests had been done "off" the model, but it did not follow that the best strut "off" the model would be the best strut "on" the model. The tests made with struts similar to the small, blunt ones and attached to the model had their results plotted on a resistance curve. From these values, it was apparent that the resistance would be about 500 lb. for a strut 10 ft. long and 1 ft. in fore-and-aft direction, and, when compared with a 12-in. strut, it was evident that the results obtained from the model were valueless and that because the resistance of struts did not follow the law of comparison.

Further discussion was adjourned until the next meeting of the Institution, to be held on Friday, December 17.

Beating the Allies.—Readers will be concerned to hear that the King of Prussia has gravely approved, with formal ceremony, the recommendation of the Minister of Commerce that the true German prefix *Seefahrt-* be henceforward employed to the exclusion of *Navigations-*. As a result, the words *Navigationsschulen*, *Navigationslehrer* and others of that ilk are no longer known in the German tongue, and all dictionaries should be amended accordingly. Though it must go against the German grain to sacrifice three letters per word in this manner, there is always the consolation that the new compounds are of truly fearsome appearance and of the same superb timbre throughout. As, for example, *Seefahrtvorschullehrer!*

UNITED STATES SHIPBUILDING.

The Bureau of Navigation, Department of Commerce, reports 88 sailing, steam, gas, and unrigged vessels of 17,368 gross tons built in the United States and officially numbered during the month of October, 1915, as follows:

	Atlantic and Gulf.		Pacific.		Porto Rico.		Great Lakes.		Western Rivers.		Total.	
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Wood.												
Sailing	3	2,068	...	...	1	8	..	..	...	...	4	2,076
Steam ..	3	250	...	...			5	108	...	...	8	358
Gas	19	363	4	60	..	..	14	136	11	148	48	707
Unrigged	11	3,486	1	9		..	2	315	2	50	16	3,860
Total	36	6,167	5	69	1	8	21	559	13	198	76	7,001
Metal.												
Sailing ...	..	...	...	..	...	...	...	...	...	...	...	...
Steam ..	2	5,496	...	..		...	5	4,370	...	...	7	9,866
Gas	..	...	..	..	..	..	...	..	1	9	1	9
Unrigged .	...	...	..	...	..	...	2	470	2	22	4	492
Total	2	5,496		...		..	7	4,840	3	31	12	10,367
Totals.												
Sailing . ..	3	2,068	...	...	1	8	...	...	...	...	4	2,076
Steam	5	5,746	..	..	...	...	10	4,478	...	...	15	10,224
Gas .. .	19	363	4	60	..	...	14	136	12	157	49	716
Unrigged ..	11	3,486	1	9	..	...	4	785	4	72	20	4,352
Grand total ...	38	11,663	5	69	1	8	28	5,399	16	229	88	17,368

The largest steel steamers included in these figures are:—

Name of Vessel.	Gross.	Where Built.	Name of Owner.
Plymouth	5,266	Camden, N. J. ...	Coastwise Transportation Co.
Vaque	1,414	Ecorse, Mich. ..	Clyde Steamship Co.
Luca	1,414	,, ..	,,
Yuma	1,414	,, ..	,,

The Demand for Engineers.—Apart from munition workers in the general acceptance of the term, and the pressing needs of the merchant service, it is considered that a great number of mechanics are available for the requirements of the Navy if only the need for their services were made known to them. The principal demand comes for those who could enter as electrical artificers and engine-room artificers, who enter the Navy with the rating of chief petty officers. During the period of the war, men are accepted between the ages of 21 and 45. For rating as engine-room artificers, men who have experience and are competent workmen in the trades of engine fitters and turners, copper smiths, boiler makers, and engine smiths are required. An examination is usually held on entry, but in the case of a candidate who holds a Board of Trade Certificate as a first class or second class engineer and can produce certificates of character and ability from the works in which he has learnt his trade, exemption is granted. Engine-room artificers are entered as chief petty officers. Fitters, turners and instrument makers are required by the Navy as electrical artificers. Candidates for this rating are accepted for the period of the war between the ages of 21 and 45. The pay is also the same as engine-room artificers, and an examination in fitting and turning or instrument making is imposed. Electrical artificers may be recommended for a practical course of training which is carried out on board the *Vernon*, which is moored at Portsmouth, or on board the *Defiance* at Devonport. In addition to these requirements there is also an urgent demand for motor boat drivers, including qualified internal combustion mechanics for inland water transport, Royal Engineers. The pay and prospects are good.

GENERAL NEWS SECTION.

PERSONAL.

Captain Robert O'Keeffe Purdon, late of the Cunard Steamship Company, died at his residence, Huskisson Street, Liverpool, recently.

The death has just taken place of Mr. James Rankin at the age of 86, who previous to his retirement was associated for over 50 years with the well-known shipbuilding firm of Clover, Clayton & Co.

Mr. W. D. Smith has been elected President of the American Shipbuilding Company. Mr. H. A. Christy, Chairman of the Board of Directors, is said to have resigned because of differences with the Board.

Colonel H. Concanon, Sir E. L. Fletcher and Mr. A. B. Cauty (Managers of the White Star, Dominion and American Lines) have been elected Liverpool directors of the Oceanic Steam Navigation Ltd. (White Star Line).

The death has occurred, at Leith, of Captain William Thomson, late dockmaster at Leith. Captain Thomson was for about 30 years in the employment of Leith Dock Commission, first as assistant, and latterly, on the retirement of Captain Rose, as dockmaster. He retired four years ago. Captain Thomson was about 70 years of age.

Captain Gilbert Symons, of the Penzance steamship *Cloch*, has been presented by the King and Government of Norway with a piece of plate in recognition of the rescue of three members of the crew of the Norwegian steam vessel *Waterloo*, off the Lizard, last December. The rescue was effected in circumstances of "the greatest heroism." The remaining 14 of the crew were drowned.

The Board of Trade have awarded a piece of plate to Mr. Alfred Emil Zachariassen, master of the Norwegian barque *Cairnsmore*, of Horten, in recognition of his services in rescuing the shipwrecked crews of the steam trawlers *Cassio*, *Hermione* and *Sutton*, of Hull, and the steam liner *Honoria*, of Grimsby, on July 24-25, in the North Sea.

Mr. Edward Holmes, Whitchurch, near Cardiff, died on Saturday last. Deceased, who was 69 years of age, was a Cardiff & Barry Channel pilot for about 35 years and retired about nine years ago. For six years he was a member of the Barry Pilotage Board and piloted the first vessel—steamer, *Ninian Stuart*—to enter the Roath Dock, Cardiff.

An interesting personality has passed away at Hull in the person of Captain R. Moore, aged 74 years, who had a long and often vivid experience of the old sailing ships. He was born on the sea and spent half a century on it. In the course of an adventurous career in trading in all parts of the world he suffered many privations but never lost a ship. His first command was on a barque at Newcastle in 1866.

Sir Thomas Benjamin Bowring, of Palace Gate, Kensington, W., and Pitt House, Moreton Hampstead, Devon, a director of C. T. Bowring & Co., Ltd., shipowners and merchants, of Winchester House, London, E.C., and Liverpool, and a director of the Assam Oil Company, the British & Foreign Oil & Rubber Company, the Burmah Oil Company, the English & American Shipping Company, who died October 18 last, aged 68 years, left £303,566 gross and £291,288 net. Among the legacies provided for in the will are £500 to the Royal Merchant Seamen's Orphan Asylum, Snaresbrook; £50 a year for 21 years to the directors of his five companies in London, Liverpool and New York, to be applied for the encouragement of good fellowship among the members of the staff, and annuities of £52 to two employees of his firm.

Mr. D. A. Thomas, head of the South Wales Coal Combine, has purchased the Monmouthshire estates of the late Mr. Perry Herrick, of over 4,000 acres, including two historic castles.

Through the intervention of the American Embassy in Berlin arrangements have been made for Engineer Bachelor, of the stranded British submarine *E* 13, who is interned at Copenhagen, and is sick, to be given his freedom and sent back to England. In return, a sick German sailor of the auxiliary cruiser *Berlin*, interned in Norway, is to be released.

PENINSULAR & ORIENTAL STEAM NAVIGATION COMPANY.

Seventy-Fifth Annual Report.

The directors submit the accounts for the year ending September 30, 1915, in anticipation of the meeting to be held on December 8.

The form in which the accounts are submitted on this occasion has been simplified. The result of the year's operations, after making allowance for depreciation and contingencies, and bringing the Provident Good Service Fund up to £150,000, which is the company's actuarial liability, shows a balance of £499,863 11s. 5d., which includes £68,702 18s. 5d. brought forward from the previous year.

The directors propose to divide this amount as follows:—

	£	s.	d.
5 per cent. dividend on the preference stock	152,000	0	0
10 per cent. dividend and 5 per cent. bonus on the deferred stock, free of income-tax (of which 2½ per cent. on preferred stock and 5 per cent. on deferred stock was paid as an interim dividend in May last)	269,681	2	0
	421,681	2	0
Carry forward ...	78,182	9	5
	499,863	11	5

Notwithstanding the fact that a large number of the company's steamers was commandeered by Government for war purposes and that 31 of the ships are still in Government service, no mail departure has had to be abandoned, and the services were satisfactorily maintained, though at much extra cost.

The freight market ruled high during the last nine months of the year, but the company did not thereby benefit to any extent, their steamers for the most part being necessarily restricted in cargo capacity, owing to the high speed required by the mail contract, and the large space occupied by mails and parcels post.

The amalgamation with the British India Company is working satisfactorily. Economies, as well as advantages to the public, are being gradually introduced.

A non-contributory pension scheme has been inaugurated for the commanders and chief engineers, involving, with existing pensions, an actuarial liability which has been provided for by the addition of £100,000 to the Provident Good Service Fund. The Board are satisfied that this will have the approval of the proprietors. A banking system for all the company's employees, afloat and ashore, has also been established, which appears to be appreciated.

The directors regret to have to record the wreck of the *Nile* in the Inland Sea of Japan on January 11, and of the *Nubia* near Colombo on June 20, happily without loss of life in either case. They have also to report, with great regret, that the *India*, requisitioned by Government as an armed cruiser, was destroyed by an enemy submarine on August 8 last. In this case the vessel was manned by a Government crew and there was, unfortunately, considerable loss of life. The loss of the *Nile* and *Nubia* falls on the company, but in the case of the India, she having been entirely taken over by the Admiralty and out of the company's charge, her loss falls on the Government.

Two of the older steamers, *Arcadia* and *Oriental*, have been sold.

The expense of working, maintaining and running the steamers

[illegible] seriously owing to advances in wages and to higher prices of stores and coal, while delays in loading and discharging [illegible] have lengthened the duration of voyages, still further adding to the cost.

The rates of charter for vessels commandeered by the Government have been very moderate, shipowners having displayed a patriotic disposition to assist the Government in the present great emergency.

The insurance against war risk has involved a premium of over £275,000. The attacks by enemy submarines on neutral shipping have occasioned the Board considerable anxiety, but the exertions, skill and seamanship of the company's commanders, officers and engineers, in cases where attempts to capture P. & O. steamers [illegible] have so frustrated this operation, deserve [illegible] No praise is too high for the elaborate and highly successful arrangements made by the Admiralty and British naval officers all over the world to guard and protect the merchant service.

The company, like most institutions, has suffered a serious loss through the fall in value of the securities in which its reserves are invested. It is difficult to say what the depreciation is in the absence of a free market, but it amounts to a very large sum, the greater portion having been caused by the war.

There has been no opportunity to lay down new ships in the past 12 months, and the two mail steamers which are under construction, and which in the ordinary course would have been delivered this autumn, will not be completed for some considerable time, the builders having been obliged to devote their attention to Government work.

Instead of investing the amounts set aside for depreciation in new tonnage, as would have been the case in normal circumstances, the directors have placed them, together with the proceeds of certain securities which have been sold, in the Government War Loan and Treasury Bills. The Board have no doubt that this will have the approval of the proprietors.

Mr. Ernest Haliburton Cunard and Mr. Peter Williams retire by rotation at this meeting, and, being eligible, offer themselves for re-election.

Sir Thomas Sutherland retired from the Board at the end of last year, when Lord Inchcape was elected chairman. The Board desire to place on record their high appreciation of the services rendered by Sir Thomas Sutherland to the company over a period of upwards of 60 years, during 34 of which he occupied the position of chairman.

P. & O. Fleet.

		Gross Registered Tonnage.			Gross Registered Tonnage.
1.	*Maloja* ...	[illegible]	37.	[illegible]	6,850
2.	*Medina* ...	[illegible]	38.	[illegible]	6,712
[illegible]	[illegible]	[illegible]	39.	[illegible]	6,703
4.	*Morea* ...	[illegible]	40.	[illegible]	6,702
5.	*Mantua* ...	[illegible]	41.	[illegible]	6,701
6.	*Malwa* ...	[illegible]	42.	[illegible]	6,696
7.	*M*[illegible]	[illegible]	43.	[illegible]	6,695
8.	*M*[illegible]	[illegible]	44.	[illegible]	6,684
9.	*Moultan* ...	9,723	45.	[illegible]	6,580
10.	*Mongolia* ...	9,505	46.	[illegible]	6,482
11.	*M*[illegible]	[illegible]	47.	*Mantua*	6,034
12.	*Kalyan* ...	8,987	48.	[illegible]	6,009
13.	*K*[illegible]	8,983	49.	[illegible]	5,995
14.	*Khiva* ...	8,947	50.	[illegible]	5,884
15.	*Khyber* ...	8,906	51.	[illegible]	5,842
16.	[illegible]	8,811	52.	*Isis*	1,728
17.	[illegible]	8,810	53.	[illegible]	1,728
18.	*Devanha* ...	8,092			
19.	[illegible]	8,089		Building.	
20.	*Dongola* ...	8,056	[illegible]		16,230
21.	*Persia*	7,974	[illegible]		14,600
22.	[illegible]	7,941			
23.	*Arabia* ...	7,903		P. & O. Branch Service to Australia via the Cape.	
24.	[illegible]	7,902			
25.	[illegible]	7,901	55.	*Berrima* ...	11,137
26.	[illegible]	7,841	57.	*Ballarat* ...	11,135
27.	*Palma* ...	7,732	[illegible]	[illegible]	11,120
28.	[illegible]	7,696	59.	[illegible]	11,120
29.	*Palermo* ...	7,597	60.	*Inkosi*	11,118
30.	[illegible]	7,572	61.	*Geelong*	7,951
31.	[illegible]	7,376	62.	[illegible]	6,646
32.	*Plassy* ...	7,340			
33.	*Himalaya*	6,899			518,188
34.	*Nagoya* ...	6,854		Steam tenders and tugs	3,306
35.	*Nellore* ...	6,853			
36.	*Nankin* ...	6,850		Total	521,494

Statement of Accounts of the Peninsular & Oriental Steam Navigation Company for the Year ended September 30, 1915.

Dr. PROFIT AND LOSS ACCOUNT. *Cr.*

	£ s. d.		£ s. d.
[illegible]	£3,[illegible]	By amount brought forward from last account after payment of interim dividends in December	68,702 18 5
Profit for the year ended 30th May [illegible]			
[illegible] per cent. preferred stock £76,[illegible]		,, Net result after providing for depreciation, &c., and making provision for actuarial liability incurred by establishing pension scheme	494,160 13 0
[illegible] per cent. deferred stock £89,[illegible]			
—£165,893 14 0			
Proposed dividends for the year:			
2½ per cent. on preferred stock £76,000 0 0			
5 per cent. on deferred stock ... 89,893 14 0			
Bonus [illegible] per cent. [illegible] £[illegible] 14 0			
[illegible]			
[illegible]			
Balance to be carried forward			
	£562,863 11 5		£562,863 11 5

Dr. GENERAL BALANCE SHEET, SEPTEMBER 30, 1915. *Cr.*

LIABILITIES.	£ s. d.		ASSETS.	£ s. d.
Capital issued and paid up:				
In cumulative 5 per cent. preferred stock £5,040,000 0 0			By steamers, tugs and launches as per list	4,567,158 10 6
In deferred stock [illegible] 0 0			,, Payments on account of new ships	256,220 3 5
[illegible]	[illegible]		,, Coal, naval and victualling stores, freehold and other property, workshops and machinery, wharves, moorings, &c., sundry investments and cash at bankers and in hand	6,453,945 1 9
,, Debenture stock at 3½ per cent. ...	1,800,000 0 0			
,, Reserve fund	1,374,000 0 0			
,, [illegible]	450,000 0 0			
,, Provident good service fund ...	150,000 0 0			
,, Bills payable, sundry balances, accounts not closed and debts owing by Company	2,271,479 18 3			
,, Profit and loss account £199,863 11 5				
[illegible] ... 165,893 14 0				
	[illegible]			
	11,217,323 15 8			11,217,323 15 8

We have examined the foregoing balance sheet and accounts, and find the same to be correct. We have also examined and verified the Company's securities and [illegible].

November 2, 191[illegible]

(Signed) W. F. COURTHOPE,
F. A. WHITE, Auditors.

SHIPPING IN PARLIAMENT.

German Owners of "British" Ships.

In the House of Commons on November 23 Mr. Peto called attention to the decision in the Court of Appeal in the case of the Continental Tyre and Rubber Company (Great Britain), Ltd., *v.* Daimler & Company, Ltd., and that the majority decided that a company incorporated in this country in which all the shares except one were held by German subjects residing in Germany was an entity created by Statute and had the rights of action in our Law Courts, which were reserved in respect of individuals to British subjects and alien friends.

In the course of his argument Mr. Peto pointed out that it was technically possible for the ownership of British ships to be vested in a German company. He quoted the case of the Groedel Steamship Company, Ltd., which was a British company and owned four large steamships, worth about a quarter of a million of money. The nominal share capital was £5,000, divided into 500 shares of £10 each. On May 11 of last year those shares were divided as follows :—Baron Hermann Groedel, 249 shares ; Baroness Delanie Groedel, 245 shares ; Baron Albert Groedel, one share ; Charles Arnold Smith, one share ; B. A. Smith, one share ; Eugen Hilb, one share ; Harrison Meldrum, one share ; C. E. Surnson, one share. The baron and baroness, he said, were Austrian citizens residing at Buda-Pesth. There was a string of Austrian directors, including the baron and the other baron, who own one share. They were replaced by six new shareholders, about three of whom had British names and who presumably were of British origin, at the commencement of hostilities about September 3 or 4. But those ships were at present running. He believed two of them had been requisitioned by the Admiralty, and the other two were doing their ordinary trade. It had been said that, after all, in respect of those ships that, although they had had the privilege of flying the British flag, and although they were practically entirely owned by enemies of this country, the position with regard to them was practically the same as if they had happened to be in our ports at the commencement of hostilities, and that they would in that case have been taken over and perhaps used by the Admiralty much as at present. That might be so, but supposing that those four ships had been on the high seas and making for some port and encountered one of His Majesty's ships they would have been lawful prizes of war, and there would not have been any question of handing anything back to the baron or baroness on the determination of hostilities. What he asked the House to consider was whether the present state of the law with regard to the particular matter of the ownership of steamship and the more general matter of the right of access to our Courts for alien enemies when they disguised themselves as a British company was in accordance with public policy or in accordance with what would be understood to be common sense by ordinary non-legal members of the community ?

Mr. Butcher said that the policy of the Merchant Shipping Acts from the very first time they were passed was to insure that British ships should never be owned by aliens. Indeed, it was laid down in express terms that no alien should, either directly or indirectly, become the owner of a British ship and so be able to fly the British flag. The way that that was to be effected—because, of course, this present war was not anticipated—by the Merchant Shipping Act was by providing that no alien should own ships either directly or beneficially through a trustee. This was a very conceivable and very rational policy. But in the Continental Tyre Company case they had the astonishing result that a company composed, it might be, of two or more enemy aliens could, under this legal fiction of being a British corporation—have all the rights of a British company owning British ships sailing under the British flag, and—Germans masquerading as a British company—earning dividends for Germans during the war. True these dividends were held up during the war, but they were in the hands of a trustee, and might be handed over to the German alien enemies at the end of the war. That was not the only result. If a ship were owned by German alien enemies trading as a firm, that ship could be captured on the high seas, brought into a Prize Court, and condemned. But if the ship were owned, as many of these British ships were, by German alien enemies, whereby they carried on as a British corporation, they could fly the British flag and sail the seas with perfect safety ; they could never be captured, brought into court, and adjudicated upon. This was against public policy, and also against the express policy laid down in the Merchant Shipping Act.

In the course of his reply Sir F. E. Smith pointed out the difficulties of legislation at the present juncture and maintained that in the meanwhile none of the money was being paid to an alien enemy. He was not averse to legislation to prevent the recurrence of such registrations but he only knew of one suggestion which to any extent met the facts, and it was that one should take a certain proportion and say if the alien holding passed beyond that proportion, then in such-and-such a case it should not be treated as a British corporation. The trouble was that by the transfer of four or five shares one would always have a company over the dividing line. The matter was not so simple as hon. Gentlemen supposed.

FROM OUR CORRESPONDENTS.

CLYDE AND DISTRICT.

(From Our Own Correspondent.)

Glasgow.

The number of new merchant vessels launched on the Clyde during the past month compares rather unfavourably with that of previous months, and shows clearly that the construction of mercantile tonnage is still a matter of secondary importance with shipbuilders on the river. Accurate statistics with regard to output are, however, difficult to obtain, as the shipbuilders' organisations have decided that no returns as to the work done by individual firms will be issued this year. During November the output on the Clyde consisted of four vessels of an aggregate measurement of between 8,000 and 9,000 tons, compared with nine vessels of nearly 20,000 in the preceding month. This brings the total for the 11 months of the year up to 75 vessels of about 205,000 tons, compared with 206 vessels of about 441,000 tons at the corresponding date last year.

The largest vessel launched on the Clyde during the past month was the oil tank steamer *Vennachar*, which the Greenock & Grangemouth Company have built for Gow, Harrison & Co., Glasgow. The machinery for this vessel is being supplied by Rankin & Blackmore, Greenock. On the east coast of Scotland the output consisted of a cargo steamer of 250 tons, built by A. Jeffrey & Co., Alloa, for Larne owners, and three trawlers built at Aberdeen, two of them being by the John Duthie Torry Shipbuilding Company, and the third by A. Hall & Co.

Repair Work on the Clyde.

Ship repair and overhaul work is again pretty brisk on the Clyde. At Glasgow the Anchor liner *Tuscania*, which took the ground while leaving Glasgow about a fortnight ago, has been put into dry dock for survey and repair. The two Park liners, referred to in this column recently, are still in the hands of repairers, and Barclay, Curle & Co., have the Newcastle steamer *Turret Court* in their dry dock at Elderslie. On the lower reaches of the river, James Lamount & Co. have quite a large amount of work on hand both in dry dock and in harbour at Greenock. They have a tug and a couple of motor vessels in the East India dry dock, and in the harbour they have a coasting steamer. The tug is to get a new stem, and the coaster has had a number of new plates fitted. Certain alterations are being made on several vessels by Murdoch & Murray, in order to fit them for new service, and one or two other firms have smaller jobs on hand.

Grain Imports at Glasgow.

The imports of grain at Glasgow continue to be exceptionally heavy, and the grain discharging plants at the granary, Meadowside, and at other parts of the harbour are being taxed to their utmost extent. About a week ago several liners and other steamers arrived from Quebec and Montreal—the last for season before the closing of the St. Lawrence—and these all brought in heavy shipments. Four Donaldson liners, which arrived from various ports, are said to have brought in a total of over 12,000 tons in addition to other cargo.

MERSEY SHIPPING AND SHIPBUILDING.

(From Our Own Correspondent.)

Liverpool.

All the trades unions associated with the shipbuilding and engineering trades in Liverpool have applied for an immediate advance in wages of 6s. per week, and in this application all the unions ask also for an additional 12s. per week to charge hands, which means that these latter want 18s. per week over and above

The average weekly earnings of the mechanical trades in this district is about 50s. per week, besides about 15s. per week overtime.

The Local Munitions Tribunal is not now called upon to deal with quite so many cases of workmen losing time as formerly. At the last sitting a few days ago there were only eight cases down for hearing [illegible] for withholding leaving certificates, and five against workmen for being absent from work without permission.

The only item arising out of the sitting on Saturday last worth noting is the statement made by the chairman, that he had received [illegible] the Ministry of Munitions that regulations directing that a certificate of discharge ought not to be refused to a workman unless fully employed on munition work. This new rule is likely to produce a disturbing effect in Liverpool engineering and ship-repairing shops. Many of these have fitting, overhauling and repairing jobs on Government account in hand for a brief period, and then turn their men on mercantile work until they are again urgently required for [illegible] work. As these men do not come under the description of being fully employed on munition work, they will be entitled to leave at once, and upset altogether the organisation of many workshops. Representations are being made to the Minister of Munitions regarding this new regulation which is likely to have an effect not thought of when it was authorised.

Coal on the Liverpool market for industrial and shipping requirements is slightly improved in value, and supplies of Lancashire steams at the Liverpool or Garston tips are now worth 19s. 6d. to 20s. Rail transport is said to be causing delay in delivery, making prompt supplies very unreliable.

Irish traffic to this port is still dislocated by the continued suspension of the Dublin Steam Packet Company's service owing to labour troubles. The only sailings being made are by the Tedcastle Line, which is unable to handle all the traffic.

CUNARD SHARES.

The steady appreciation of Cunard Line shares was carried further on Monday this week when there were buyers on the Liverpool Stock Exchange at 67s. There seems to be a pretty general expectation of a substantial dividend for the current year.

MEDITERRANEAN SERVICES.

The Mediterranean steamship services both outward and homeward are running very irregularly just now, and both shippers and importers are experiencing very great trouble with regard to cargo they are interested in. I learn that steamers that can be despatched up to the end of the year are practically full up now, while in respect of homeward traffic importers cannot get their requirements satisfied even at the high freights now ruling. The obvious conclusion is that the scarcity of boats is becoming more pronounced.

C.P.R. SCHOLARSHIPS.

It is interesting to note that the Canadian Pacific Railway Company have just completed a scheme for establishing a number of scholarships on board the cadet ship *Conway*, moored in the Mersey, whereby on the conclusion of their training they will be appointed as cadets on the steamers of this company.

BELFAST SHIPBUILDING AND SHIPPING.

(From Our Own Correspondent.)

Belfast.

The wages question has been definitely settled in Belfast the result of the inquiry by the committee on production presided over by Sir George Askwith being received on November 20. Confirming the advance of 2s. per week on time and 5 per cent. on piece agreed on by the parties recently subject to the consent of the Minister of Munitions which is necessary in the case of all controlled firms. The original claim of the Federated Trades acting jointly and the Boilermakers' Society acting independently was for an increase equivalent to about 9s. per week. The employers offered 2s. and five per cent. subject to the approval of the Munitions Department whose Chief referred the matter to the committee on production which heard evidence for both sides on November 18, and reported to Mr. Lloyd George who has agreed to the advance mutually settled. The increase is to be retrospective from October 1.

It is to be hoped that the workers will be content with this advance which is in addition to the bonus granted early in the war and has been given at a time when the men are earning unprecedentedly large wages by means of overtime. On the very day that Sir George Askwith's committee met Mr. Bonar Law speaking in the House of Commons as the temporary head of the Government said that those who represented the working classes as well as the commercial classes should set their forces resolutely against any increased pay by the Government in any shape or form for anything that had to be got in connection with the war. The great bulk of the work on hand in Belfast is war work and here we have the Government within a day of Mr. Bonar Law's warning granting this advance to men who already are paid a very reasonable wage.

BRISK WORK.

Work of all kinds—new, repair, refit, overhaul and conversion work continues very plentiful in Belfast where a shortage of skilled labour is still a handicap. There is nothing new to report in connection with merchant tonnage which is occupying a very secondary place owing to more urgent requirements.

SHIPPING TRADE.

The shipping statistics of the port continue to show a shrinkage, the falling-off in the tonnage of vessels arrived from January 1 to the middle of November being 278,624 tons compared with that of the same period in 1913. Two-thirds of the decrease is in the cross-channel and coastwise trade and one-third in the foreign. The decrease in each instance is entirely due to war conditions which have cut off a number of the regular services to the port.

SOUTH WALES NOTES.

(From Our Own Correspondent.)

Cardiff.

Important matters concerning the Welsh coal trade and the effect of the shortage of tonnage at home ports were discussed at meetings of the Cardiff and Newport (Mon.) Chambers of Commerce last week. Mr. T. E. Watson, President of the Cardiff Chamber pointed out that many collieries were only working three or four days a week not for want of trade but for want of tonnage with a consequential loss to the workers, railway and dock companies and more important still a loss of exports at a time when the need for "silver bullets" to carry the war to a successful conclusion was imperative. Also during the past three months between 40 and 50 British steamers had been chartered each month for the carriage of American coal to British markets and the United States was now shipping coal at the rate of about 12,000,000 tons per annum against a normal export of 2,000,000 tons. Consumers in neutral countries had also placed orders for American coal extending over the next three, four or even five years. On the other hand freight rates had increased five or sixfold and there was no limit to which rates might go. The Government had taken measures to palliate the evil by prohibiting British vessels from trading between foreign countries, except by licence, and by appointing a committee to go into the question of transport services. To put maximum freights, however, would only mean the transfer of the money from the shipowner to the merchants' pocket.

TRADE STRANGLED BY OFFICIALDOM.

Mr. Pardoe Thomas at the meeting of the Newport Chamber of Commerce in referring to the present stagnation in the coal trade said it was time that the Government called in business men to assist and advise them. At present there was too much officialdom with the result that trade was strangled. Mr. T. H. Mordey said that the Government, instead of relieving the market were making matters worse while a large amount of tonnage which had been requisitioned was being badly used. A letter was read with regard to delays in granting shipping licences in which it was stated that the War Trade Department were issuing over 2,000 licences a day, and receiving between 4,000 and 5,000 letters and the number of papers dealt with daily in the Registry exceeded 10,000.

SMART REPAIRING JOB.

Thomas Diamond & Co. Cardiff, have just completed one of the largest bow repairing jobs ever placed in South Wales. Not only

was the work of a very extensive character but the difficulties in the way of obtaining labour, owing to a large number of men having joined His Majesty's Forces or gone to work in Government yards, have been particularly onerous. Despite these adverse circumstances the work has been carried out in remarkably quick time. The job which consisted of the repairing of the damage sustained by the Cardiff steamer *Cardiff Hall* as the result of a collision, illustrated on pages 325 and 326 of the *Shipbuilding and Shipping Record* of October 14, necessitated the renewal of practically the whole of the bows and stem of the vessel from the collision bulkhead forward a distance of about 20 ft. The work included the renewal of the collision bulkhead itself, the whole of the forecastle deck and erections and all the internal parts, viz., frames, floors, beams, stringers, plates, &c. The vessel arrived at Cardiff on September 26 and work was commenced on the following day. On October 2 she went into dry-dock and was undocked on November 17 and the work completed on November 27, the task of renewing the whole of the bows, &c., being completed in just two months. At Barry and Newport, C. H. Bailey are repairing 29 steamers including collision repairs to the steamer *Umber*, rudder work on the steamer *Emir* and general repairs to the steamers *Earl of Forfar*, *Hooton*, *Cape Mazagan*, *Elswick House*, *Deneb*, *Glenmorag*, *Neuquen*, *Eolo* and *Verdun*. The Barry Graving Dock & Engineering Company, Ltd., have a good job on the London steamer *Zeta* which had her decks swept in the Bay of Biscay. Practically all the deck erections from the main bridge forward must be renewed besides extensive work in the saloon. The Cardiff Channel Dry Docks & Pontoon Company, Ltd., have a big plating job on the Sunderland steamer *Lord Stewart* practically the whole of her sides, including frames, &c., having to be straightened or renewed while the London steamer *Kirkwood* is having about 18 shell plates renewed. John Shearman & Co. are busy working on 36 vessels at Cardiff, Barry and Newport.

THE FREIGHT MARKETS.

(From Our Own Correspondents.)

London.

So far as the level of rates is concerned there is little pronounced alteration to record in the freight markets. For vessels to load at United States Atlantic grain ports there has been some slight slackening of demand, but by the time these lines appear in print renewed activity may have come along. It is reported that from the Northern Range a 20,000-quarter, 10 per cent. steamer has been closed at 19s. for Barcelona. For grain to Piræus something like 19s. to 19s. 6d. can be had. The steamer *Thistleard* has been fixed to load at Newport News for Marseilles or Cette at 14s. Baltimore has taken up a large steamer for London or Avonmouth, mid-January–mid-February loading, at 11s. 6d. barley, part heavy 1s. extra, and part oats at 9s. 6d. Towards the close of last week, for Northern Range loading, the steamers *Elswick Grange*, 25,000 quarters, 10 per cent., the *Venus*, 20,000 quarters, 10 per cent., and the *Calliope*, 28,000, 10 per cent., were fixed for the West Coast of Ireland at 13s. 6d., or if to East Coast United Kingdom, 13s. 9d. In the Plate section firmness prevails, and for vessels giving December-January loading 90s. to 92s. 6d. is about the rate for up-river home. The West Coast market is described as steady, and there is a dearth of tonnage. Bombay is worth 77s. 6d. on deadweight to the United Kingdom. Karachi to Dieppe has paid 75s. for the *Belle of France*. From Hornillo Bay to Middlesbrough 18s. 6d. has been conceded to a steamer to load 5,000 tons of ore. Bilbao to the East Coast United Kingdom has been closed at 18s. 6d. for a 2,500-ton steamer, whilst from the same port to Maryport a 1,900-ton boat has been chartered at 19s. On the North-East Coast the dearth of tonnage continues to influence the freight market, and rates are still rising. Shipowners, indeed, openly profess that freights are too high—or, rather, too unhealthily high. As indicating the marked advance, it need only be said that 50s. has been paid from the Tyne to Marseilles, and the record figure of 55s. has been secured by a 6,000-tonner for Savona. Bordeaux has been done at 36s. 6d. and 37s. 6d., and 26s. 3d. has been paid for Rouen. Tyne–London still stands at 14s. 6d. Cardiff reports that more tonnage is available, and this being the case charterers are somewhat inclined to hold their hands so far as fixing is concerned. Recent representative fixtures are :—Rouen, 22s. 6d. ; Chantenay, 39 fr. ; Marseilles, 64 fr. ; Lisbon, 29s. ; and Brest, 17s. 6d. Newport to Bordeaux has been done at 41 fr., and Port Talbot to St. Nazaire at 38 fr. Liverpool to Bordeaux has paid 35s.

Glasgow.

The continued shortage of tonnage has resulted in a further upward tendency in rates. In outwards from Wales quotations rose to 55s. Port Said, 55s. West Italy, 63 fr. Marseilles and 40s. River Plate. Actual transactions reported gave little indication, however, as to the value of tonnage to load before Christmas. The number of fixtures reported at Glasgow during the week are considerably under the average. The following give an indication of the rates current in the outward coal trades :—Glasgow to Genoa, 55s. guaranteed terms ; Greencock to Calais or Boulogne, 500 tons, 24s. 6d. ; Ayr to St. Nazaire or La Rochelle, 1,600 tons, 38 fr. ; Ayr to Bordeaux, 2,800 tons, 41 fr. In the homeward markets the tone was firm all round. The River Plate paid 87s. 6d. to the United Kingdom only, while the United Kingdom with option of French ports was reported to have conceded 90s. and over. A Glasgow steamer was fixed at 90s. grain, 105s. oats from Bahia Blanca to London. Another locally-owned steamer was fixed from the Northern range to London or Barrow at 13s. heavy grain, while 15s. 6d. was paid to a Northern French port and 18s. 6d. to West Italy. Towards the end of the week there was a slight advance on these rates, 13s. 6d. having been paid to the United Kingdom, and 16s. to Northern France. In the East there was very little new to report, Bombay quoting 77s. 6d., and Calcutta 100s. jute, while Burmah quoted 105s. rice.

Newcastle-on-Tyne.

The volume of business transacted on the local outward freight market during the past week is again very unsatisfactory, but rates continue to advance somewhat sensationally. Tonnage supplies are short and shippers carry on a keen competition for boats, chiefly in consequence of the continued heavy inquiry for Northumberland and Durham coal. A number of collieries are anxiously looking for steamers. Practically nothing has been done in coasting business, but London has been fixed for at 14s. 6d., an advance of 6d. on last week's rate. Chartering for North France is steady and prices for cargo space have increased rapidly during the week under review. Rouen is from 2s. 6d. to 3s. 6d. advanced and up to 26s. has been paid for that port ; Havre is from 6d. to 2s. 6d. dearer ; Boulogne at 26s. registers a rise of 4s. ; and Dunkirk is from 4s. to 5s. up. The Bay market has been quite busy, and here, too, rates are considerably advanced, Bordeaux having been frequently done at increases of from 1s. to 3s. 6d. on last week's quotations, and St. Nazaire being 6s. up. Very little is doing for the Mediterranean, but rates are slightly stiffer for Italian ports. For Genoa, 52s. 6d. with full guarantees as regards demurrage, &c., has been paid, as against 50s. on similar terms done last week. Latest information is to the effect that 40 steamers are now awaiting berths at Genoa. Fixtures arranged since last report include the following :—Boulogne, 1,000, 26s. ; Bayonne, 1,500, 40s. ; Bordeaux, 3,300; 36s. ; 3,900, 37s. ; 3,400, 37s. 6d. ; 1,650, 38s. ; 1,000, 38s. 6d. , Civita Vecchia, 2,500, 53s. 6d. ; Caen, 23s. 9d. ; Copenhagen, 1,500, 19s. ; Calais, 450, 24s. ; 900, 26s. ; Dunkirk, 700, 30s., coke, voyages ; 1,900, 26s. ; Genoa, 7,000, 52s. 6d., full guarantees ; Havre, 1,500, 23s. ; 1,250, 25s. ; London, 2,600, 14s. 6d. ; Lisbon, 4,000, 30s. 6d. ; Las Palmas, 1,900, 30s. ; La Pallice, 2,000, 35s. ; Naples, 2,500, 52s. 6d. ; Oran, 3,000, 37s. 9d. ; 800, 37s. 6d. ; Rouen, 1,200, 24s. 6d. ; 2,000, 25s. 6d. ; 1,700, 26s. ; St. Nazaire, 2,500, 36s. ; Treport, 1,000, 26s.

Liverpool.

This market has changed little from a week ago, and a general survey reveals freights all round holding to their firmness, with a continued scarcity of tonnage predominating. In these circumstances only a quiet trade is being done, though there are many inquiries about for ships in the general trades, and also on time charter account. Outward rates, particularly for coal, are maintained to most destinations, though these may be held with difficulty if hopes of a better supply of tonnage are realised. The lower rate to River Plate is doubtless influenced by better market prospects homeward there. Time rates are very firm, but fixtures are few owing to short supply of suitable ships. North Atlantic rounds indicate 26s. on d.w., and tempting time rates are offering in the Eastern and other general trades. Homeward business continues to hold a strong position. North America is still active for grain, and 13s. 3d. to 13s. 9d. is paid from the Northern Range to United Kingdom, while the rates to West Italy are 19s., to Marseilles, 17s. 6d., and to French Atlantic ports, 16s. 6d. Cotton transactions are few except to Mediterranean, pending adjustment of rates to United Kingdom. River Plate is taking tonnage more freely at firm rates, business done being on basis of 90s. for December-January and 87s. 6d. January-February San Lorenzo.

to United Kingdom. Bahia Blanca to London paid 90s., wheat and 105s. coals for December-January. Eastern markets are quiet but steady. Australia holds to 95s. to United Kingdom and Continent or 100s. coast basis to Mediterranean. Madras to Mediterranean obtains 120s. and a mixed cargo has paid 120s. between these two ports with remaining cargo of ore from Bombay to London, Manchester or Liverpool at 60s. Mediterranean home-ward trade quiet, but our ports fairly active to United States and home ports at firm rates. The remote re-opening of the Panama Canal, probably end of January, is keeping North Pacific and nitrate ports bare of tonnage, rates from the former indicating 130s. and the latter advanced to 100s. to United Kingdom or France. Sail freights outwards are dull, but homewards from wheat and nitrate ports firm and fairly active.

Cardiff and Swansea.

Freight market conditions have not undergone any appreciable change since our last report. Rates continue to advance, while there is a good inquiry for most directions with tonnage supplies still inadequate to meet requirements. Altogether vessels to carry 162,650 tons were fixed to load at Cardiff or Newport last week or 4,650 tons more than in the previous week. For the Mediterranean rates maintained a very firm tone, Algiers fixing at 56 and 57 fr. (a new record); Barcelona, 39s. (twice), 39s. 6d. and 40s. (a new record); Gibraltar, 32s. 6d. (a new record); Genoa, with options, 52s. 6d. and 54s. (a new record); Lisbon, 29s. (300 tons delivery) and 29s. (one—500 tons delivery—a new record); Marseilles, 63 fr. (twice) and 64 fr. (twice—a record); Port Said, 47s. 6d. (January-February loading), 50s. (December 20 loading) and 55s. (twice—a new record); and Valencia, 35s. Bay and Coasting business was comparatively slow with rates firmly upheld. Bordeaux fixing at 40 fr. (twice) and 41 fr. (three) and 42 fr. (a new record); Caen, 23s. and 21s. 6d.; Havre, 20s. (a new record); Nantes, 39 fr. (a new record); Rouen, 22s. 6d. (twice), 22s. (twice) and 23s. (a new record); St. Nazaire, 35, 36, 38 and 40 fr. (a new record); and Santander, 26s. Chartering was brisker for South America and Brazil on the basis of Buenos Ayres or La Plata, 38s. 6d. (twice); Bahia Blanca, 45s.; Monte Video, 37s. 6d. and 39s. 6d. (twice—a new record); River Plate, 40s.; and Rio de Janeiro, 41s. 6d. (twice); while Eastern business was confined to Colombo at 51s. 3d. (a new record). The swansea market was quiet, though 33,460 tons were fixed or 11,278 tons more than in the preceding week. With tonnage sparingly offered and a good demand rates were easily upheld at Algiers, 58 fr. (twice); Oran, 54 fr.; Dieppe, 22s. (a new record); Havre, 20s. and 21s. (a new record); Honfleur, 22s. (a new record); and Rouen, 22s., 22s. 6d. and 23s. (four—a new record).

Hull.

The famine in tonnage is the chief feature of the market and it has forced rates up to an alarming extent. There appears to be no immediate expectations of relief from the paucity of tonnage, and rates will, in all probability, rise still higher. In the Mediterranean direction the remarkable figure of 55s. quotes for Genoa or Savona from Hull, and the rate for Alexandria from Hull is 52s. 6d. to 53s. The short-distance trades have been seriously curtailed in their activity by the difficulty of getting boats, and 25s. now rules for Rouen from Hull, 24s. 6d. for Dieppe from Hull, 14s. for London from Hull, and 14s. 6d. for London from Goole.

THE COAL MARKETS.

(From Our Own Correspondent.)

It is a commonplace to say that now, as for a long time past, the supply of tonnage has been a most important factor in regard to the export coal trade of this country. At Cardiff the past week-end witnessed a fair arrival of boats, whilst from Newcastle it is reported that a good volume of tonnage came in. Neither on the Tyne nor at Cardiff is there weakness to be recorded. Cardiff indeed, reports that the coal market is steadying up whilst the position on the Tyne is described as free from actual weakness. At the moment there is every reason to suppose that at Cardiff business is being quietly fixing up to a considerable extent for next year, on coalowners' terms. There is, apparently, some nervousness on the part of merchants, the view being that with limited outputs it will be wiser to come in now and contract rather than wait only to find that they are unable to fix up. At the beginning of the present week it was reported that operations to cover the whole of next year had been concluded for ordinary second Admiralties at 24s., and at 25s. for superior seconds. For business to the end of the present year there is a good demand for all leading class coals. Small steams are distinctly firm. Ordinary second Admiralties stand at about 19s. to 19s. 6d., whilst dry coals evince more firmness on the basis, for the best sorts, of 24s. to 25s. For ordinary descriptions 23s. 6d. was the quoted price.

As to the outlook, the feeling is that prices for Cardiff coal, whilst they may go considerably higher, are certainly not likely to fall. On the basis of recent prices there has been but a meagre profit for the collieries, and this is as true of those collieries which supply the Admiralty as the lower grade ones. Recent representative quotations on the Cardiff market are:—Second Cardiff large coal, 19s. to 19s. 6d.; ordinary large steam, 18s. to 18s. 6d.; best drys, 24s. to 25s.; ordinary drys, 21s. 6d. to 23s. 6d.; best Monmouthshire Black Veins, 19s. to 20s.; Western Valleys, 18s. 6d. to 19s.; Eastern Valleys (best), 18s. to 18s. 6d.; Eastern Valleys (other sorts), 17s. to 18s.; best small steams, 11s. 6d. to 12s. 6d.; and second small steams, 10s. 6d. to 11s.

As already intimated the Tyne market is in no sense of the word characterised by weakness, despite the retarding influences of none too much tonnage and the pronounced rise in freights. The market may be a little more irregular here and there—small steams are certainly weaker—but the tone can only be described as good. The fact really is that the limited output and the good demand, have conjointly had the effect of nullifying the difficulty that might have been looked for from the dearth of tonnage. There is a good home request for coal for industrial purpose, and also for household use. Consequently coal which cannot be exported finds a ready home market. There has been very little lost time at the pits, for the demands from London and the near French ports are such as to keep them working fairly regularly. Nor must it be overlooked that, with December here—a short working month—a rush of business is to be anticipated. As a matter of fact, there is now in evidence a pronounced inquiry for December loading.

Prices may be described as firm. Practically no D.C.B. large steams are procurable for the present month; the collieries, with no produce to dispose of, nominally quote 20s., whilst holders ask 19s. 9d. to 20s. Owing to difficulties in regard to licences for cargoes intended for Northern European destinations, smalls have fallen in value; the colliery stocks are growing. D.C.B. smalls can be bought at 10s. 6d., with Tyne primes at 13s. Bunkers are firm, standing at 16s. 3d. to 16s. 6d. for ordinaries, 17s. 3d. for bests, and 19s. to 20s. for superiors.

Since our last reference to the Scottish coal trade, the West Coast market has suffered some dislocation from foggy weather. Shipping traffic on the Clyde was for practically a week suspended. Incoming colliers lay at the Tail of the Bank, unable to get to their loading berths, and outward-bound coal ships were unable to put to sea. This week the market opened very firm, and there was an advance, as compared with last week, in certain quotations. In regard to named ells, the collieries have not much to dispose of for prompt shipment, and the price quoted is strong at round about 18s. 9d. All classes of splint, especially the prime brands, are reported as well booked. For navigations, too, a large volume of business has been put through. There is every reason to anticipate that the present, week will prove a busy one for the Fifeshire collieries, with, doubtless some delay in loading. In regard to Lothians it is probable that there will be a fairly lengthy turn at the docks. West Scottish quotations include:—Best ell, 18s. 3d. to 18s. 6d.; ordinary ell, 17s. 9d. to 18s.; best splint, 23s. to 25s.; and ordinary splint, 19s. to 19s. 6d. In the Fifeshire section, screened navigation is quoted at 23s. to 24s.; unscreened at 21s. to 22s.; and first-class steam, at 21s. to 21s. 6d. Lothian best steam stands at 18s. 6d. to 19s. 6d.; and ordinary steam at 18s. to 18s. 6d.

In the London market there is a good demand for practically all classes of coal, and on 'Change, with colliery representatives having little to dispose of, would-be purchasers had to resort to the factors. Good Yorkshire house coal commanded, so it was reported on Monday, a minimum of 20s. per ton. For seaborne coals, thanks to the prevailing high rate of freights, the market was practically nominal. Supplies coming by rail were quickly snapped up. There was a marked demand for Midland steam and industrial sorts.

TENDERS INVITED.

Tenders are invited by the Portuguese Government for 22 motor launches. Particulars may be obtained from the Consulate-General for Portugal, London. The closing date is January 29, 1916.

NEWS PARAGRAPHS.

County Shipping Company, Ltd.—The shareholders have decided to wind up and have appointed Mr. R. J. Thomas Managing Director of Thomas, Sons & Co., Ltd., as liquidator.

The Panama Canal.—Turner, Davidson & Co., Ltd., 1, Fenchurch Avenue, London, E.C. advise us under date November 25 as follows: "We have this morning received the following cable from our Panama friends: 'Do not consider there is any prospect of Canal opening before 3rd and 4th weeks in January.'"

Rapid Discharge of a Grain Vessel.—An instance of remarkable dispatch in the discharge of a wheat cargo by the Port of London Authority has recently occurred at their central granary in the Millwall Dock. The steamship *Bland Hall* with 7,116 tons of wheat on board commenced discharge at 7 a.m. on the 13th inst. and finished at 7 p.m. on the 16th having worked for 29 hours. The rate of discharge per hour was 243½ tons or 1,100 quarters, constituting an unusually high average, especially having regard to the conditions under which work is carried on during war time.

Steel Prices.—David Colville & Sons, Ltd., Dalzell Steel and Iron Works, Motherwell, advise us of the following alterations in the prices of their brands:—

	£	s.	d.
Dalzell	12	10	0
Dalzell best	12	17	6
Dalzell best horse shoe	13	0	0
Dalzell angle	12	10	0
Dalzell best angle	12	17	6
Dalzell best best	13	0	0
Dalzell extra best	13	12	6

U.S. Naval Motor Boats.—Upon the recommendation of Rear-Admiral Joseph Strauss, Chief of Ordnance, the Navy Department has decided to purchase a high power motor boat for experimental purposes to develop the value of this type of craft in protection against submarine raids. It is likely that the trial work to be done with this motor boat to be bought by the Navy Department will result in the addition of this type of craft to the regular naval building programme. The motor boat which the Navy Department will purchase will be thoroughly seaworthy and equipped with one 18-in. torpedo tube and one one-pounder Q.F. gun. Its estimated cost is £6,000. Designs for the vessel have already been prepared.

Mesopotamia Campaign.—Mr. John F. Lynch, Chairman of the Euphrates and Tigris Steam Navigation Company Ltd., writes from 3, Salter's Hall Court, E.C. to the *Daily Telegraph*. "The perusal of Sir Mark Sykes's interesting account of the battle of Kut-el-Amara in your issue of November 22, in which he jokingly infers that "the bounty of heaven and the Ottoman Government" were instrumental in providing the fleet employed by the British-Indian Expedition in their advance up the River Tigris, emphasises the fact that all published reports of the operations in Mesopotamia omit any reference to the fleet of steamers, tugs and lighters belonging to the Euphrates and Tigris Steam Navigation Company, Ltd. These vessels, including British mercantile officers and engineers with an intimate knowledge of the difficult navigation of the rivers, have been employed in fighting and transport work in all the engagements on the Tigris and Euphrates since the arrival of the British-Indian Forces in Mesopotamia, and their assistance has, admittedly, largely contributed to the success of the expedition."

Reduced Charter Rates for Armed Merchant Cruisers.—The Admiralty has issued the following announcement: "Arrangements have been made between the Admiralty and the owners of the vessels engaged as armed merchant cruisers for a reduction in the rates of hire which have, up to the present, been paid. The owners of vessels of the higher speeds have, with one or two exceptions, agreed to a 30 per cent. reduction in the rates fixed by the Sub-Committee of the Admiralty Transport Arbitration Board in October, 1914, and the owners of the other vessels have agreed to a 20 per cent. reduction in the rates provided for by the agreement of February 24, 1915. The reductions will apply as from October 1, 1915, in cases where vessels have then been on charter for a year or more, and from the date of completion of one year's service in other cases. Arrangements have also been made for a reduction in the rates of hire of vessels engaged in Australian waters. Under an agreement of March 16, 1915, owners of such vessels were entitled to an extra allowance of 3s. to 3s. 6d. per gross ton per month, as compared with vessels engaged in home waters. All the owners concerned, however, have now agreed that this allowance should not be payable after September 30, 1915, or after three months from engagement, which ever is later."

COMPANY REPORTS AND DIVIDENDS.

Mordey, Carney & Co., Ltd.—The report for the year ended September 30, states that the balance from revenue account shows a profit of £9,551 which, together with £1,062 credit balance from last account, makes a total of £10,613. After providing £2,674 for debenture interest, there remains a balance of £7,939 to be dealt with. The directors recommend the payment of a dividend of 5 per cent. free of income-tax, which will absorb £5,273 leaving a balance of £2,65 to be carried forward to next account. The following are the results of the working for the past five years:—

Year.	Ord. Div. per cent.	Profit. £
1911	Nil.	2,495
1912	Nil.	7,284.
1913	Nil.	3,886.
1914	Nil.	3,368.
1915	5	9,551.

J. Frerichs A.G. Schiffswerft Eisenwarden, Oldenburg.—This company has worked unprofitably for a number of years, and though it paid 5 per cent. dividend for 1914, conditions were so unfavourable in the spring of 1914 that it was proposed to wind up the concern. The company has, however, enjoyed the interest of the Oldenburg government, and last year the Oldenburg Ministry secured support for the company from the Deutschen Nationalbank. The latter considered it essential that the yard be extended by inclusion of adjoining reclaimed land belonging to the State; and that a representative of the State be included on the Board of the company. It is proposed to conclude this deal on the basis of the company paying all dividends up to £150 per annum to the State. At present there is a legal hitch in that a civil servant may not occupy a commercial position to which remuneration is attached whilst a person nominated by the State to represent the interests would not be elected by the shareholders, as is at present required by German law.

John I. Thornycroft & Co., Ltd.—The report for the period ending July 11 states that the balance brought forward from 1914 was £10,268 and trading profit for the period under review was £267,333. After allowing for depreciation, &c., there remains a balance of £247,938, which the directors recommend shall be dealt with as follows:—To the payment of a dividend on the preference shares at the rate of 6 per cent. per annum, £5,940; to the payment of a dividend of 10 per cent. on the ordinary shares, £14,850; to writing down goodwill account, £49,000; to transfer to special reserve account, £10,000; to transfer to reserve account, £90,000; leaving a balance to be carried forward of £78,148. The report goes on to say that as the business of the company was placed under the control of the Ministry of Munitions as from July 12, 1915, the directors therefore decided that stock should be taken as on July 11, 1915, and the accounts made up to that date for presentation to the shareholders in due course. It was also decided that the accounts of the company for the future should be made up to July 31 in each year and consequently the next report and accounts will cover the period ending July 31, 1916. Depreciation on the different classes of buildings, plant, machinery, fixtures, fittings, &c., and on patents, patterns and drawings has been written off at the same rate as in previous years, but in consequence of the plant having been in operation continuously night and day the capital expenditure incurred during the period has been charged to profit and loss account. An additional reason for the adoption of this policy is that this expenditure has been made with a view to increasing the output during the war and that the value of this increased expenditure to the company at the termination of the war is more than problematical. No special provision has been made in the accounts for income-tax or excess profits tax as in the present position of the law it is impossible to arrive at any reliable estimate of this liability. In the past it has been customary to include in the accounts only royalties actually received; but on this occasion royalties earned previous to and during the period covered by the accounts have been included. Practically the whole of the resources of the company have been employed upon war work, and the total turnover of the business has been about four times the normal average. This large turnover has been successfully carried out without a corresponding increase in the staff. In order to mark their appreciation of the work of the staff and their employees generally, the directors decided to set aside £20,000 to create a Benevolent Fund from which to make grants to members of the staff and employees in certain cases of ill-health, termination of service, &c.

THE OVERDUE MARKET.

During the past week there has been renewed activity in the overdue market, which recently has been so dull that it might be said to have ceased to exist. The most important feature of the week's trading was a rate of 20 guineas quoted on Stevens, Sutton & Stevens steamer *Kano* bound from Hadyer to Philadelphia. She sailed on November 1 and not having arrived by the 19th a rate of five guineas was quoted which has during the week to 20 guineas on Saturday. On Monday news was received of her arrival, accompanied by the information that her triple-expansion engines had been converted into compound, since November 4, presumably owing to engine trouble, which accounts for her slow passage. Several sailing vessels are being paid on: the *Biagio O.* bound from N.S.A. to the United Kingdom, 8 guineas; the *King Edward*, Salonc to the River Plate, 80 guineas, a lifeboat having been picked up off the American coast bearing her name; the *Loongana* from Fremantle, July 17 to Iquiqui, 85 guineas; the *Llandaff*, Port Arthur, Texas, August 3 to the United Kingdom, 90 guineas. Both the *Portishead* and the *Souverain*, bound from America home figured in the list at 8 and 10 guineas respectively, but news of their arrival caused them to be removed.

Two steamers in trouble also come into the market owing to their misfortunes. The *Dartford*, ashore near Southport, being quoted 15 guineas and the Norwegian steamer *Tellus* ashore at Nemuro is rated at 70 guineas per cent.

The steamer *Baron Driesen* which has been ashore at Chubbet Binna near Gwardafui for close on six months has at last been refloated and taken to Aden.

The case is somewhat interesting, not only for the long period during which she was stranded, but also for the circumstances which have combined to bring her safe to port after being exposed to diverse perils.

She was bound from Vladivostock to Hull when she went aground, and although prompt measures to refloat her were taken, the monsoon broke with her still securely held. It was feared that the weather would cause her serious damage, but having become embedded in the sand, a protective bank was formed outside her by the action of the current, to which fact she largely owes her safety from the elements. In the meantime lively interest was taken in her by the natives, who in these parts regard a wreck as a dispensation of Providence. The local Sultan being consulted, consented to guard the stranded vessel from looting for a consideration. It is feared that this consideration will prove a considerable item when the statement of claim comes to be prepared.

The vessel lay comfortably till the monsoon was over, and Sirtzers' salvage steamer *Protector* being despatched to her assistance, succeeded in getting her afloat in a very short time. It appears that she returned to Aden partly under her own steam, and the main engines are reported to have worked satisfactorily throughout. No report as to the condition of the hull has been received but the fact that all her holds are dry indicates that not much bottom damage will be found. Her cargo of beans was partly discharged before she was floated and the discharged portion has been abandoned at Bargal as useless, but the remaining portion about 47,000 bags, is believed to be sound for the greater part.

The floating of the *Baron Driesen* must be a very satisfactory event for her owners, the Northern S.S. Company of Petrograd. She is a vessel of 4,036 tons built in 1901 and valued for insurance purposes at £34,500.

"SHIPBUILDING AND SHIPPING RECORD" TABLE OF MARINE CASUALTIES

(Including losses incidental to the war).

Vessel	Gross Tonnage	Owners, Builders and Year Built.	Casualty.
Adour, ss. (ex *Gaute*) ..	1,355	Dampskibs Aktnes Ada (K. Salvesen), Kragerö. Fredriksstad Mek. Vaerks. Fredriksstad. (1906.)	See *S. & S.R.*, Nov. 18. Nov. 18: Vessel now total wreck. Part cargo salved.
Algerien, ss.	1,596	Cie. de Nav. Mixte Marseilles. A. McMillan & Son, Dumbarton. (1881.)	Nov. 29: Reported "sunk."
Amrum, s.	888	Ernst Russ Hamburg. Act. Ges. "Neptun," Rostock. (1893.)	Nov. 24: Hamburg for Solvesborg, cargo coal, ashore near Ahus. Making water.
Atle Jarl, ss.	1,240	Det Nordenfjelske Dampsk., Trondhjem. Irvine S.B. & E. Co., Irvine. (1902.)	Nov. 27. Tyne for Western Norway. General cargo and coals. Aground on sandy bottom, near Haugesund.
Biagio O., s.v. (ex *Helen*)	2,670	D. Olivari, Genoa. W. H. Potter & Sons, Liverpool. (1886.)	Nov. 26: Tacoma, U.S.A., for United Kingdom. Has not been reported since passing Tatoosh.
City of Savannah, ss.	5,664	Ocean S.S. Co. of Savannah, Savannah (U.S.A.). Delaware River Co., Chester, Pa. (1907.)	Nov. 28: Vessel collided with Italian steamer *Italia*. Both damaged.
Daldorch, ss.	1,748	J. M. Campbell & Son, Glasgow. Scott's S.B. & Eng. Co., Greenock. (1907.)	Nov. 26: Buenos Ayres for Liverpool. Aground near Southport. Unsuccessful attempt to refloat her. Now being lightened for next spring tide.
Glenesk, ss.	2,887	Glenesk SS. Co. (Milburn, Lund & Co.), Wardley. W. Doxford & Sons, Sunderland. (1906.)	Nov. 26: Baltimore for Barry Dock. Cargo wheat, encountered heavy gale; lifeboat washed away and others broken. Steering gear and rudder-head smashed.
Hav, ss. (ex *Rolfe*, ex Rolf, ex *Strand*, ex)	1,264	Dpsk. "Hav" (T. Halvorsen), Bergen. M. Pearse & Co., Stockton. (1877.)	Nov. 19: Rouen to Shields. Collided with another vessel in the Downs. Leaking.
Klar, ss.	518	Acties. Dampsk. Klar. (G. T. Brodersen), Christiania. J. Lange, Vegesack. (1884.)	Nov. 27: Reported "sunk." Crew saved.
Libra, ss.	1,838	Akties. Libra (L. Kloster), Stavanger. Sörlandets Skibsbyggeri, Skibsbyggeri, Fevig. (1913.)	Nov. 23: Aground on sandbank near San Fernando. Much damaged by fire.
Oakfield, ss.	1,615	Doughty S.S. Co. (H. Doughty & Co.), W. Hartlepool. W. Gray & Co., W. Hartlepool. (1912.)	Nov. 26: Drifting in mid-Atlantic with all propeller blades lost. Heavy sea. Lines broken twice while being towed by Italian steamer *San Giorgio* towards Fayal (Azores).
Omara, ss. ..	435	Cie. de Nav. Mixte, Marseilles. Forges & Chantiers de la Mediterranee, La Seyne. (1872.)	Nov. 29: Reported "sunk."
Tanis, ss. ..	5,966	Deutsche Dampfs. Ges. Kosmos, Hamburg. Blohm & Voss, Hamburg. (1902.)	Nov. 29. Reported "sunk." Crew saved.
Theresa, ss. (Lugger)	202	E. Kingdom, Manaos, Brazil. Murdoch & Murray, Pt. Glasgow. (1906.)	Nov. 26: Foundered at Bay Elias, River Acre (Brazil) while going up river with general cargo.
Tromsö, ss.	238	Tromsö Amts. Dampskibs., Tromso. Trondhjems Mek. Vaerks., Trondhjem. (1908.)	Nov. 17: Sank while leaving harbour. Three lives lost.

"SHIPBUILDING AND SHIPPING RECORD" TABLE OF LAUNCHES.

Date of Launch.	Name of Vessel and Type.	Owners.	Builders	Approx. Dimensions. L × B. × D	Propelling Machinery and Builders of Machinery.	Remarks.
Sept. 18	**Fojan** (cargo) ..	Knudsen, Haugesund ..	Helsingors Jernskibs-og Maskinbyggeri	247′ × 38′ × 17½′	Tr. exp 700 i.h.p	2,400 tons 9 knots.
Oct. 2 ..	**Stettin** (pass. and cargo)	Oldenburg-Portug. S. Co. ..	Nüscke & Co Stettin .	340′ × 42½′ × 28′	1,400 i.h.p	4,000 tons, 10 knots.
Nov. 10	**Ombilin**, ss. (collier)	Koninklijke Paket vaart Maats, Amsterdam	Nederlandsche Scheepsbouw Maats, Amsterdam	420′ × 54′ × 27′	Tr. exp. 2,100 i.h.p. Nederlandsche Fab. van Werk. & Spoor, Amsterdam	Displacement on 22½′ 11,500 10½ knots.
Nov. 22	**Uskmouth**, ss. ..	South Wales owners ..	John Priestman & Co., Southwick	320′ × 44½′ × 20½′	Tr. Exp., 21, 35, 57 30 N.E. Mar. Eng. Co., Sunderland	
Nov. 26	**Vennachar**, ss. (oil tanker)	Gow, Harrison & Co., Glasgow	Greenock & Grangemouth Dockyard Co., Greenock	375′ × 51½′ × 29′	Tr. Exp. 26, 43, 72 × 48 Rankin & Blackmore, Greenock	

"SHIPBUILDING AND SHIPPING RECORD" TABLE OF TRIAL TRIPS.

Sep. 23	**Samur** (motor cargo ship)	Astrachan owner	Bergsunds mek. Verksted, A.G.	215′ × 30′ × 11′	Two 4-cylr. Bergsund engines, 360 h.p. total	8½ knots.
Oct. 8...	**Trondhjem** (pass. and cargo)	Verein. Dampfschiffsgesell, Copenhagen	Helsingors Jernskibs og. Maskinbyggeri	230′ × 35′ × 23½′	Tr. Exp., 900 i.h.p....	
Nov. 25	**Lepanto**, ss. (cargo) ...	T. Wilson & Sons, Hull ...	Russell & Co., Port Glasgow	410½′ × 53½′ × 25½′	Tr. Exp., 27, 44, 73 × 48. J. G. Kincaid & Co., Greenock	
Nov. 29	**Queen Mary**, ss. (cargo)	T. Dunlop & Co., Glasgow ..	Russell & Co., Port Glasgow	423′ × 56′ × 31½′	Tr. Exp. 27, 45, 74 × 51. Rankin & Blackmore, Greenock	

"SHIPBUILDING AND SHIPPING RECORD" TABLE OF SHIP SALES.

Name and type.	Tonnage.	Dimensions. Draught in ( ).	Sold by, to	Builders, hull and year.	Machinery and builders.	Remarks.
Blakemoor, ss. (turret dk.)	3,748 gr. 2,409 net. 3,360 d.w.	342′ × 46½′ × 24¾′	Moor Line (W. Runciman), London, to Berg & Co., Cardiff.	W. Doxford & Sons, Sunderland (1906)	26, 42, 68 × 42 (W. Doxford & Sons)	–
Cambrian King, ss. (spar dk.) (ex *Ullapool*)	3,601 gr. 2,315 net. 6,000 d.w.	350′ × 46½′ × 17½′ (23⅝′)	Clifton S.S. Co. (Wylie, Ross & Co.), Liverpool, to Glasgow buyers	W. Pickersgill & Sons, Sunderland (1898)	24½, 40, 66 × 45 (G. Clark, Sunderland)	Price about £60,000.
Cabo Espartel, ss. (awning dk.) (ex *Sevillano*)	1,249 gr. 801 net. 1,600 d.w.	211′ × 32′ × 15¾′ (17½′)	Ybarra & Co., Seville, to Norwegian buyers	J. Scott & Co., Kinghorn (1894)	17, 27, 45 × 33 (J. Scott & Co.)	
Cardiffian, ss. (well dk.) (ex *Queenwood*) re-named **Afon Lliedi**	1,015 gr. 610 net. 1,480 d.w.	215½′ × 32′ × 15⅜′ (15⅛′)	O. & W. Williams & Co., Cardiff, to W. W. Coombs, Llanelly.	A. Vuijk, Capelle a/d. Ysel (1904)	17½, 28½, 46 × 30 (G. T. Grey, S. Shields)	
Hippalos, s.v. (ex *Arethusa*)	1,781 gr. 1,703 net. 2,810 d.w.	267½′ × 39½′ × 23′	Akt. Hippalos (E. Knudsen), Lillesand, to buyers not stated	Chas. Connell & Co., Glasgow (1890)	—	Price about £12,250. Changed hands in Aug., 1913, for about £5,100.
Magdala, ss. (shelter dk.)	3,509 gr. 2,179 net. 7,510 d.w.	360′ × 52′ × 23½′ (25½′)	O. Wallenberg, Stockholm, to Orient S.S. Co., Copenhagen	Northumberland S.B. Co., Newcastle (1914)	25, 41, 69 × 48 (Richardsons, Westgarth & Co., Hartlepool)	
Marika, ss. (spar dk.) (ex *Marina*, ex *Zulu*)	2,742 gr. 1,760 net. 4,265 d.w.	309¾′ 40½′ 17½′ (23¾′)	George Coulouras, Andros, to buyers not stated	R. Dixon & Co., Middlesbrough (1892)	24, 38, 64 × 42 (T. Richardson & Sons, Hartlepool)	Price about £36,000.
Mont Blanc, ss. (spar dk.)	3,121 gr. 2,252 net. 4,710 d.w.	320′ × 44¾′ × 15¼′	G. Petit, Rouen, to Cie. Générale Transatlantique, Paris, per E. Arditi, Paris	Sir Raylton Dixon & Co., Middlesbrough (1899)	24, 36½, 62 42 (N.E. Marine Co., Newcastle)	Price about £40,000.
Nikolaos, ss. (spar dk.) (ex *Republic*)	4,302 gr. 2,777 net. 7,610 d.w.	365′ × 50½′ × 18½′	E. E. Ambatielos (Ambatielo Bros.), Argostoli, to Norwegian buyers	Sunderland S.B. Co., Sunderland (1906)	26, 42, 70 × 45 (N.E. Mar. Eng. Co., Sunderland)	Price about £110,000. Sold last year for about £46,000.
Overdale, ss. (spar dk.) (ex *Dumbarton*)	3,495 gr. 2,240 net. 5,000 d.w.	340′ × 45′ × 17¾′	S.S. Overdale Co. (Babtie, Weir & Co.), Glasgow, to British buyers	A. McMillan & Son, Dumbarton (1903)	24, 40, 65 × 42 (Clyde S.B. & E. Co., Pt. Glasgow)	Price about £52,500.
Urna, ss. (ex *Carmuir*)	2,686 gr. 1,625 net. 4,710 d.w.	314½′ × 47½′ × 20¾′	O. Banck, Helsingborg, to Norwegian buyers	Russell & Co., Pt. Glasgow (1903)	22½, 37, 62 48 Kincaid & Co., Greenock)	Price about £75,000. Sold in April, 1913, for about £25,000.
Veloz, ss. (well dk.) (ex *Loch Katrine*)	1,584 gr. 925 net. 2,160 d.w.	257½′ × 36′ × 16¾′ (17¾′)	Cia. Plenciana de Nav., Bilbao, to Norwegian buyers	Gourlay Bros. & Co., Dundee (1889)	20, 32, 52 × 39 (Gourlay Bros. & Co.)	Price about £21,500.
Victoria, ss. (ex *Pendower*)	2,679 gr. 1,709 net. 4,305 d.w.	314′ × 44′ × 20¾′ (19¾′)	V. de Chavarri, Bilbao, to Norwegian buyers	Irvine & Co., W. Hartlepool (1896)	23, 37½, 61½ × 39 (Blair & Co., Stockton)	Price about £51,000. Sold in 1913 for about £19,500.
Winnfield, ss. (ex *Louise Roth*)	3,433 gr. 2,205 net. 5,800 d.w.	331′ × 47½′ × 24¾′ (22½′)	J. C. Gould & Co., Cardiff, to Cardiff buyers	W. Gray & Co., W. Hartlepool (1901)	25, 40, 65 × 42 (Cen. Mar. Eng. Works, W. Hartlepool)	Price about £51,000. Sold in 1912, for £19,500.
Wulff, s.v. ..	1,580 gr. 1,395 net 2,210 d.w.	251½′ × 36¾′ × 21½′	Actles. Wulff (M. Mosvold). Farsund, to Olav Christensen, Arendal	A. Dubigeon, Nantes (1899)		Price about £11,250.
Zanos Sifneo, ss. (ex *Armanistan*)	2,237 gr. 1,396 net. 3,860 d.w.	302½′ × 43½′ × 19¾′ (18¾′)	Sifneo frères, Pirœus, to buyers not stated	W. Gray & Co., W. Hartlepool (1901)	22, 35, 59 × 39 (Cen. Mar. Eng. Works, W. Hartlepool)	Price about £46,000.

The Barrie S.S. Co. (C. Barrie & Sons), Dundee, inform us that the report that the ss. **Den of Ewnie** has been sold is not correct.

SHIPPING SHARE MARKET.

[illegible] business is in the leading companies. It is hoped that stockbrokers will [illegible] necessary for the protection of holders of vendors' shares in one of these mushroom shipping companies to arrange for a purchase and sale of a [illegible] at the moment a pre-arranged bourse for that transaction and price to be [illegible] market and sent out through the tape machines to all the leading papers in the country. As outside agencies are at work in "pushing" the prospects of these undertakings the attention of the investor seeking a good steamship investment is attracted to the quotation, and he accepts the price as a bona-fide representation of the market value of the shares. Among shipbuilding and kindred companies it is anticipated that while the Munitions of War Act is in force, there will be a tendency to restrict dividends to the same rate as in past years, leaving any balance to accumulate until after the Excess Profits Tax has been dealt with. It is probable that many companies will set aside these sums towards the creation of dividend equalisation funds, the absence of this valuable reserve having been severely experienced in past periods of trade depression.

SHIPPING, SHIPBUILDING, ENGINEERING AND MARINE INSURANCE SHARE LIST.

SHIPPING AND DOCKS.

Name	Share and paid	Extreme quotations, 1913.	Last ann. div. % or per share.	Yield. %	Quotation, July 30, 1914.	Cash price during week.
	£					
African S.S.	2	21⅝ – 19/16	7	7½	18 – 20	18 – 20
Alert Line ... .. Deb.	10	95 – 88	4	4½	93½ – 95½	94
Another Line .. Cum. pref	10	10⅜ – 10	5½	5¼	10–10⅛	10⅛
Do. .. .. Deb.	Stk.	99⅝ – 98⅛	4½	4 5/16	104 – 106	104½
Argentine Nav. ... Cum. pref.	1	29/16 – 25/16	3	4½	1/16 – 1/16	—
Do. .. .. Deb	Bds.	101⅛ – 100⅛	6	6	98 – 100	99
Australasian Un. S. Nav. Deb.	Stk.	84⅜ – 81½	4	4 15/16	80 – 83	80 - 83
Belfast Steam .. "A"	10 (split)	5⅜ – 4⅜	6	8	4⅝ – 5	5
British & African Nav. Deb.	Stk.	102 – 101	4½	4⅜	96⅜ – 98⅛	99½
British India Nav. ... Deb.	Stk.	104 – 98⅝	4½	4½	99⅜ – 100	95
Bucknall SS. ... Cum. pref.	2	2⅜ – 1⅜	5½	—		
Cairn Line ... ... Deb.	Bds.	102 – 94	5	5½	91 – 93	90–90½
Clan Line ... ... Ord.	10	142 – 9	15	10⅝	10⅜ – 11	
Court Line ... ... Ord.	£1		10	7 1/16	—	1 1/16
Cunard SS. ... ... Ord.	1	35/8 – 2 5/8	20	6½	1⅜ – 1½	3/8
Do. ... Cum. pref.	Stk.	103 – 97⅞	5	5½	99 – 101	91⅜
Do. ... ... Deb.	Stk.	102⅝ – 99	4⅜	4½	101 – 103	99½
Elder Line ... ... Deb.	Stk.	103 – 100	4½	5	98 – 102	90
Elder Dempster ... Cum. pref.	1	1½ – 1 5/16	5½	5 11/16	1⅛ – 1 1/16	1/16
Do. ... ... Deb.	Stk.	105 – 99⅛	5	5½	102–104	91¼
Ellerman Lines ... Pref. Ord.	10	10⅝ – 10 7/16	6⅞	6	10–10⅜	9⅜
Do. ... Cum. pref.	10	10⅜ – 10 1/16	4½	4⅜	10–10⅜	9⅜
France Fenwick ... Cum. pref.	5	97/8 – 92/8	5⅜	6⅜	4⅜ –5	4⅜
Furness, Withy ... Ord.	1	34 3/8 – 25/8	10	6¼	1⅜ – 1⅜	1⅜
Do. ... Cum. pref.	10	9⅜ – 9⅛	5	5⅛	9⅜ – 10	9⅛
General Steam Nav. Ord.	7½	6 1/16 – 5/8	6	7	5⅜ – 5⅝	6⅜
Do. ... ... Pref.	8	7¼ – 7⅜	6	8	7 1/16 – 7⅛	6⅜
Houlder Line ... Cum. pref.	5	85/8 – 60/-	Nil	Nil.	2⅜ – 2⅝	3 1/16
Do. ... ... Deb.	Stk.	84⅛ – 80	4⅜	5¼	81 –86	84½
Houlder Bros. ... Cum. pref.	5	4⅜ – 3	5⅜	5⅛	4⅜ – 4⅜	4¼
Do. ... ... Deb.	Stk.	85 – 78	4⅜	5⅜	81 – 86	82
India Gen. Nav. & Rly. ... Ord.	10	9⅜ – 7 1/16	6	7 1/16	9 – 10	9⅜
Indo-China N. ... Pref Ord.	5	5 1/16 – 3 7/8	6	6 1/16	3⅛ – 4⅛	3⅜
Irrawaddy Flotilla	40	125 – 114	15	5 1/16	126⅜ – 128½	—
King Line ... ... Ord.	10	9 1/16 – 8	8	7	8⅜ – 9⅜	11⅛
La Guaira Harbour ... Deb.	Stk.	87 –79	5	7 1/16	78 – 80	66
Lamport & Holt ... Cum. pref.	£1	1 1/16 – 13/16	6	6	1 1/16 – 1 1/16	1/16
Leyland (F.) ... Cum. pref.	10	11 – 9⅜	10		7⅛ – 8¼	7⅛
Do. ... ... Deb.	100	99⅜ – 95½	4	4	99 – 101	—
Mercantile SS. ... ... Ord.	5	8 1/16 – 6⅜	17½	10⅛	6 – 6⅜	5⅜
Do. ... ... Pref.	1	18/– – 18 3	5	5½	¾ – 1	1/16
Moor Line ... ... Ord.	10	14 – 11 5/16	15	—	—	—
Nelson Steam Nav. ... Deb.	100	103⅜ – 99	5	5½	99⅜ – 101⅜	97½
New Zealand ... ... Ord.	£10	20½ – 10⅜	8	4½	14½ – 15⅜	13⅞
Do. ... ... Deb. Stk.	Stk.	95 – 92½	4	4½	92 – 94	89⅝
Nitrate Producers SS. ... Ord.	5	8⅝ – 8	17⅜	6⅝	8 – 8⅜	12¾
Do. ... Cum. pref.	5	5 – 97/6	5	—	4⅝ – 5	4⅝ – 5
Oceanic Steam. Nav. ... Deb.	100	100 – 96⅞	4⅜	4¼	97 – 99	98½
Orient.Stm.Nav.Co. Cum. pref.	10	10⅜ – 9⅝	5	5 1/16	9⅜ – 10	9⅞
Do. ... ... Deb.	100	99 – 94⅜	4⅜	4⅝	98 – 100	96
P. & O. S. N. ... Cum pref.	100	125½ – 107	5	5¼	109 – 112	97½
Do. ... ... Def.	100	350 – 270	15	4⅓	270 – 290	292
Do. ... ... Deb. Stk.	Stk.	91 – 83	3⅜	5	84 – 86	70
Prince Line	1	25/8 – 20/-	5	2½	1 – 1⅛	—
R.M.S.P. ... ... Ord.	100	143 – 100⅜	Nil.	Nil.	82 – 87	97
Do. ... ... Pret.	Stk.	100⅜ – 96	5	5¼	98 – 101	80½
Do. ... ... Deb.	Stk.	104⅜ – 100⅜	4⅜	5¼	101 – 103	88½
Shaw, Savill & Alb. Cum. pref.	5	5 3/16 – 96/3	5	—	4⅜ – 5	4⅜ – 5
Shell Transport ... ... Ord.	1	5 1/16 – 96/10½	30	6½	4 – 4⅛	4⅛
Do. ... Cum pref.	10	11 7/16 – 10	5	—	10⅜ – 10⅝	9⅞
Sutherland SS. Co.	£1	1⅛ – 1	20	13⅜	1 – 1⅛	1⅛
Union-Castle SS. Cum. pref.	10	10 – 9⅜	4½	5	8¾ – 9⅛	8
Do. ... ... Deb.	Stk.	95⅜ – 92	4	4⅜	93 – 95	88
West Hartlepool ... ... Pref.	10	4⅜ – 3 1/16	5½	9¼	2⅝ – 3⅜	5 3/16

INSURANCE.

Alliance	20 (2·4 pd.)	12⅞ – 11⅝	12 -	6½	11⅞ – 12⅜	9⅝
Do. (new shares)	1	14⅞ – 12⅝	12/-	7½	13⅝ – 14½	10⅜
Indem. Mutual Marine	15 (3 pd.)	10⅜ – 8⅝	18/-	8½	10 – 11	9⅜
London Assurance	25 (2½ pd.)	54 – 49	20	6	54 – 56	42½
Marine Insurance	25 (15 pd.)	38⅜ – 36½	45/-	6½	38⅜ – 39⅜	34½
Maritime Insurance	10 (2 pd.)	5⅝ – 4 1/16	12½	—	8 1/16 – 8⅜	—
Merchants' Marine Insurance ...	10 (2½ pd.)	66 3 – 61 3	7½	5	4 – 4½	3⅞
N. British & Mercantile Ord.	25 (6½ pd.)	40½ – 38½	40/-	7	40½ – 41½	29
Do. Pref.	Stk.	100⅜ – 95½	4	5¼	98 – 100	77½
Phœnix Assurance	10 (1 pd.)	7⅛ – 7	40	6½	7⅜ – 7½	7
Reliance Marine	10 (2 pd.)	7 – 6⅝	17½	4	7 9/16 – 7⅝	7
Royal Exchange Assurance ..	Stk.	210 – 196⅛	10	5¼	213 – 218	183
Sea Insurance	10 (2 pd.)	20 – 17½	8	4 1/16	20 – 21	20½
World Marine, Limited ...	5 (2 pd.)	25/8 – 23 1/16	5	5¼	1 1/16 – 1 1/16	1 1/16

* With arrears. † Includes 2½% bonus.

IRON AND STEEL.

Name.	Share and paid.	Extreme quotations, 1913.	Last ann. div. % or per share.	Yield. %	Quotation, July 30, 1914.	Cash price during week.
	£					
Babcock & Wilcox .. Ord.	1	69/4½ – 56/3	14	6½	2⅜ – 2⅝	2 1/16
Baldwins .. Cum. pref.	1	22/6 – 21/3	6	5 13/16	1 3/16 – 1 5/16	1 3/16
Do. ... ... Deb.	Stk.	100⅛ – 100⅛	4	4	99 – 99	98
Bayliss, Jones .. Cum. pref.	1		5	7½	3/8 – 5/8	3/8 – 11/16
Bell Bros. ... ... Cum pref.	10	12 1/16 – 11	6	5 1/16	11⅛ – 12⅛	10 15/16
Do. ... ... Deb.	Stk.	98 – 96⅜	4	4 1/16	96 – 98	96 – 98
Bessemer (Henry) ... Ord.	1	1 5/16 – 1 1/16	10	8¾	1⅛ – 1 1/16	1 1/16 – 1⅛
Bolckow Vaughan .. Ord.	1	22/6 – 19/4½	6	6¼	1 1/16 – 1⅛	1 1/16
Do. ... ... Cum. pref.	20	21⅛ – 20/–	5	5⅛	20 – 21	19⅞
Cargo Fleet Iron ... ... Ord.	1	11/10½ – 7/6	2½	5	1⅛ – 1 3/16	1 1/16
Do. ... ... Deb.	100	91 – 85½	4½	5	89 – 92	89
Consett Iron Co. ... ... Ord.	1	88/6 – 74/6	12½	14½	3¼ – 3⅜	2 15/16
Dominion Iron & Steel	Bds.	100⅛ – 88⅛	5	6¼	83 – 87	74½
Dorman, Long ... ... Ord.	1	21/6 – 16/9	8	7	1 7/16 – 1 9/16	1 7/16
Do. ... ... Deb.	Stk.	88½ – 85⅝	4	4½	87 – 90	84¼
Ebbw Vale Steel & Iron Ord.	1	18/– – 16/–	7½	7 1/16	1 5/16 – 1 7/16	1 5/16
Guest, Keen & Nettlefds Ord.	1	68/9 – 61/3	15	5	3 3/16 – 3 5/16	3
Do. ... ... Cum. pref.	5	5 3/16 – 5 1/16	5	4 15/16	5 1/16 – 5 3/16	5 1/16
Do. ... ... Deb.	Stk.	100⅜ – 95⅜	4	4½	96 – 98	83 5/16
Hadfield's Steel Foundry Ord.	1	63/– – 58/9	22½	6¾	3 – 3⅛	3 1/16
Hawthorn (R. & W.) Leslie Ord.	10	13 – 12	10	7½	13⅜ – 13⅝	12⅞ – 13⅜
Ibbotson Bros. ... . 5 (4 pd.)		7 – 5½	10	7 1/16	6 – 6⅜	6 – 6⅜
Jessop (W.) & Sons ... Ord. 5 (4 pd.)		6⅜ – 6⅜	15	11 5/16	5⅞ – 6⅛	6⅛
Lanarkshire Steel Cum. pref.	10	7⅛ – 6½	5	6 1/16	5⅛ – 6⅜	6
Lysaght (J.) ... Cum. pref.	1	27/6 – 25/–	6	5	1⅛ – 1⅜	1⅜
Do. ... ... Deb.	Stk.	108½ – 102½	4½	—	104 – 106	—
Manganese Bronze ... Ord.	1	⅜ – ⅛	6	11	5/16 – 7/16	5/16
Do. ... ... Cum. pref.	1	1 – ⅜	8	8 1/16	¾ – 1	3/4
North-Eastern Steel ... Deb.	Stk.	89 – 92	4½	-	—	—
Palmers Ship & Iron "A"	1	1/16 – 1/16	Nil	Nil.	5/16 – 3/8	1/4
Scott (Walter) ... ... Ord.	1	16/– – 14/6	7½	10½	7/8 – ¾	¾
Do. ... ... Deb.	Stk.	86 – 82	4	4½	81 82	89 – 91
Sheffield Forge ... ... Ord.	1	1⅝ – 1⅜	12½	7	1⅜ – 1⅜	1 3/16
Shelton Iron & Steel ... Deb.	100	99½ – 90	5	5¼	93 – 98xd	94⅝
S. Durham Steel & Iron Ord.	1	35/– – 23/6	10	8	1 3/16 – 1⅛	1⅛
Do ... ... Cum. pref.	1	20/6 – 19/-	8	5 1/16	1⅛ – 1 1/16	1 1/16
Do. ... ... Deb.	Stk.	95 – 98	4½	4⅝	90 – 92	90 – 92
Steel Co. of Scotland ... Ord.	10	12⅜ – 8⅜	5	5½	8⅝ 9	8¼ – 9¼
Stewarts & Lloyds Pref. ord.	10	21 1/16 – 20	10	5½	20 – 21	19⅝
Do. ... .. Cum. pref.	10	14 3/16 – 13⅛	6	4⅝	11 1/16 – 13 1/16	13 1/16
Stone (J.) ... ... Cum. pref.	10	9⅛ – 9	5	5⅛	8¾ – 9⅛xd	9⅛
United States Steel ... Ord.	100$	71⅛ – 50	3	3⅜	61 – 61⅛	92
Do. ... ... Cum. pref.	100$	113⅜ – 104½	7	5⅜	112 – 113	122⅛
Vickers Ltd. ... ... Ord.	1	43/6 – 33 3	2½	7½	1 1/16 – 1⅛	1⅛
Do. ... . Pref.	Stk.	106½ – 99	5	5⅛	104 – 107	92
Do. ... ... Deb.	Stk.	100⅝ – 91¼	4	4½	96⅛ – 98½	86⅝
Weardale Steel .. Def. ord.	1	21 – – 17/-	6	7⅛	⅜ – 1/16	—
Do. ... ... Cum. pref.	1	20 1⅝ – 18 -	6	6½	1⅛ – 1	1⅛
Do. ... ... Deb.	Stk.	77 – 73½	4	5	77 80	77 – 80
Workington Iron & Steel Ord.	1	16/6 – 12/3	4	5½	3 1/16 – 3 5/16	3 1/16

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Armstrong, Whitworth Ord.	1	60 – –39/	12½	6	13 1/16 – 2 1/16	1⅛
Do. ... ... Cum. pref.	5	95 – –84/6	4	5¼	4 15/16 – 4 1/16	3 15/16
Do. ... ... Deb.	Stk.	98½ – 94½	5	6¼	96 – 98	81
Beardmore (W.) ... ... Deb.	100	96⅜ – 91¼	4½	5¼	94 – 96	89
Brown (John) ... ... Ord.	1 (15s. pd.)	23/– – 17/9	12½	9⅜	1 5/16 – 1 3/16xd	—
Do. ... ... Cum. pref.	10	10⅛ – 9 1/16	9	5 1/16	9⅜ – 10xd	8⅝
Cammell Laird ... ... Ord.	5	3⅜ – 2/3	7½	7½	3⅛ – 4⅛	4
Do. ... ... Cum. pref.	5	92/6 – 79/–	5	6¼	4 – 4⅜	3⅞
Do. ... ... Deb.	100	90⅜ – 84½	4½	5	92 – 94	90
Dunlop (Jas.) ... ... Ord.	1	18/6 – 17/6	Nil.	—	1 5/16 – 1 7/16	1 5/16
Do. ... ... Cum. pref.	1	1⅛ – ⅞	6	7½	⅞ – 1	1 1/16
Fairfield Shipbldg Cum. pref.	10	10 – 7½	8	8 1/16	—	7⅝
Fleming & Ferguson ... Ord.	10	20/– – 12½	10	6½	14½ – 14¾	14½
Gray (Wm.) ... ... Deb.	100	100⅜ – 100	4½	4½	100-102	100
Henderson (D. & W.) Cum. pref.	1	⅝ – 7/16	5	12	7/16 – 9/16	7/16
Richardsons Westgarth Ord.	1	3/6 – 1/9	Nil.	Nil.	1/16 – ⅛	—
Do. ... ... Cum. pref.	1	9 9 – 1 3	Nil.	Nil.	3/16 – ¼	—
Do. ... ... Deb.	Stk.	70 – 58	1½	6½	55 - 58	60
Simons (W.) ... ... Cum. pref.	10	10⅛ – 10	5	4½	10¼ – 10½	10¼
Stephenson (R.) ... ... Ord.	1	66⅜ – 53	Nil.	Nil.	—	—
Do. ... ... Deb.	Stk.	66¼ – 63	Nil.	Nil.	—	—
Swan, Hunter & W. R. ... Ord.	1	19 10⅜ – 16/-	†15	10⅜	15/16 – 1	1⅛
Do. ... ... Cum. pref.	1	19/9 – 17/9	5	—	1 1/16 – 1 1/8	1 1/16
Do. ... ... Deb.	Stk.	90⅜ – 88	4½	4 9/16	90 – 93	90 – 93
Thornycroft (John I.) ... Ord.	1	27/6 – 12/6	8	8	7/8 – 1	1 1/16
Do. ... ... Cum. pref	1	19 3 – 11,3	6	7⅛	1 1/16 – 1⅛	—
Do. ... . Deb.	100	94 – 91	5	5 1/16	88 – 92	93
Wallsend Slipway ... Ord.	1	1 1/16 – 1⅛	10	—	1 3/16 – 1⅛	—
Do. ... ... Cum. pref.	1	20 – –20 -	5	—	1⅛ – 1 1/16	—

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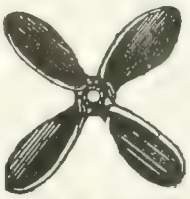

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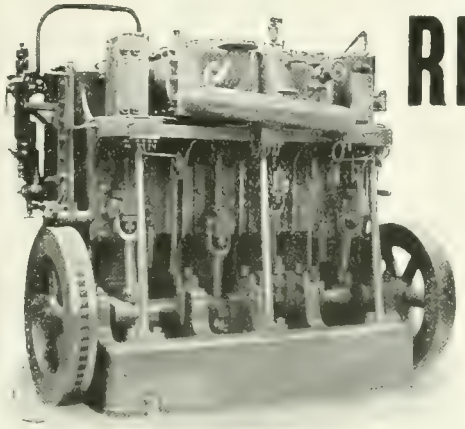

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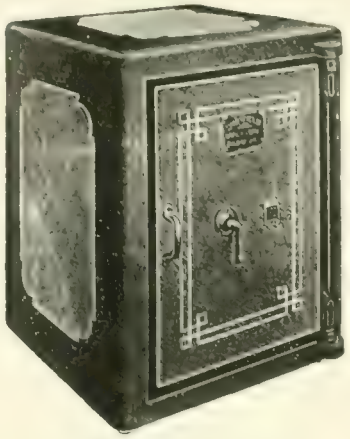

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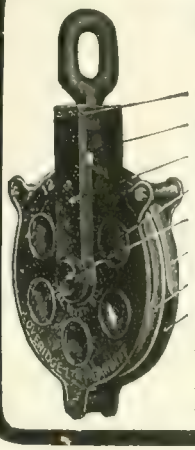

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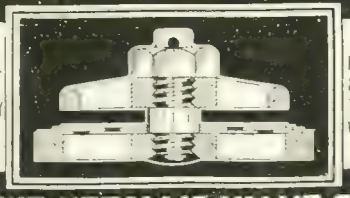

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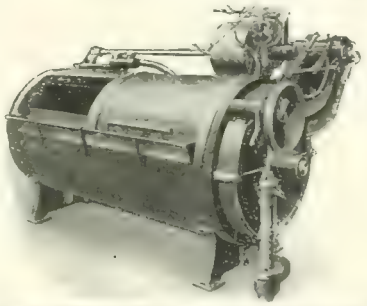

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BOILER MOUNTINGS—
Cockburns Ltd., Cardonald, Nr Glasgow.
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.
Royles Ltd., Irlam, Nr. Manchester.

BOILER PLATES (Steel)—
Leeds Forge Co., Ltd., Leeds.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.

BOILER PRESERVATIVE—
Atlas Preservative Co., Ltd., Deptford, S.E.

BOILER TUBES—
Yorkshire Copper Works, Ltd., Leeds.

BORING MACHINES—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.
Greenwood & Batley, Ltd., Albion Works, Leeds.

BRASS & COPPER FITTINGS—
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

BRASS & COPPER RODS—
Delta Metal Co., Delta Works, East Greenwich, London, S.E.

BRASS FOUNDERS—
Billington & Newton, Ltd., Longport, Staffs.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow. [Street, Glasgow.
McGeoch, Wm., & Co., Ltd., 28, West Campbell
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.
Williams, Wm., Alexandra Brass Foundry, Cardiff.

BRASS NAME-PLATES—
Metograph Co., 280, Cathedral Street, Glasgow.
Rennie & Co., North Greenhill Road, Paisley.

BRASS TUBES—
Yorkshire Copper Works, Ltd., Leeds.

BRASSWORK—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.

BRONZE (Manganese)—
Billington & Newton, Ltd., Longport, Staffs.
Bowran, Robt., & Co., Ltd., 4, St. Nicholas Buildings, Newcastle-on-Tyne.
Delta Metal Co., Ld., E. Greenwich, London, S.E.
Stone, J., & Co., Ltd., Deptford, London, S.E.

BRIGHT STEEL—
Stonehouse Works Co., Ltd., Houghton Street, West Bromwich.

BUCKETS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Hingley & Lamb. Ltd., Stour Works, Lye, Worcs.

BULKHEADS (Patent)—
Hogg-Carr Construction Co., Ltd., Newcastle-on-Tyne.

BUOYANT DECK SEATS— [Liverpool.
Crichton, C. & H., Ltd., Huskisson Engine Works,
Linkleter's Patent Ship Fittings Co., Hudson Street, North Shields.

BUOYS—
Crichton, C. & H., Ltd., Huskisson Engine Works, Liverpool.
Hingley & Sons, Ltd., Netherton Iron Works, Dudley, Staffs.

CABINET MAKERS—
Stewart, Archibald & Co., 40-48, Union Street, Glasgow.

CABLES (Chains)—
Byers, W. L., & Co., Ltd., Tavistock House, Sunderland.
Hingley & Sons, Ltd., Netherton Iron Works, Dudley, Staffs.
Sykes, Richard, & Son, Ltd., Cradley Heath.
Taylor, Samuel, & Sons (Brierley Hill), Ltd., Brierley Hill, Staffs.
Wright, Joseph, & Co., Ltd., Tipton, Staffs.

CAISSONS & DOCK GATES—
Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne.

CALORIFIERS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Royles Ltd., Irlam, Nr. Manchester.

CAPSTANS (Electric)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Mactaggart, Scott & Co., Ld., Loanhead, Edinburgh.
Stothert & Pitt, Ltd., Bath.

CARGO BLOCKS—
Higginson & Co., 7, Hurst Street, Liverpool.

CARPETS—
Stewart, Archibald & Co., 40-48, Union St., Glasgow.

CASE HARDENING BOXES—
Else, John, & Son, Ltd., 48, Muntz St., Birmingham

CASE HARDENING COMPOSITION—
Else, John, & Son, Ltd., 48, Muntz St., Birmingham

CASE HARDENING OIL—
Else, John, & Son, Ltd., 48, Muntz St., Birmingham

CAST BRASS PLATES—
Brown, Robert, & Co., 12, Espedair St., Paisley.

CASTINGS (Brass)—
Dixon, S., & Sons, Ltd., Leeds.

CASTINGS (Steel)—
Brown, John, & Co., Atlas Works, Sheffield, and Clydebank, Nr. Glasgow.
Darlington Forge Co., Ltd., Darlington.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.
Stewarts & Lloyd's, Ltd., 41, Oswald St., Glasgow.

CASTINGS (Steel, Iron and Brass)—
Darlington Forge Co., Ltd., Darlington.
Hamilton, A., & Sons, 13, Bute Crescent, Docks, Cardiff.
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

CEMENT—
Aberthaw & Bristol Channel Portland Cement Co., Ltd., Merthyr House, Cardiff.

COAL—
Beynon, T., & Co., Ltd., Merthyr House, Cardiff.
Britannic Merthyr Coal Co., Ltd., Cambrian Bldgs., Cardiff.
Cambrian Collieries, Ltd., Cambrian Bldgs., Cardiff.
Davis, D., & Sons, Ltd., Cymric Bldgs., Cardiff.
Ebbw Vale Steel, Iron & Coal Co., Ltd., Merthyr House, Cardiff.
Fernhill Collieries, Ltd., Merthyr House, Cardiff.
Glamorgan Coal Co., Ltd., Cambrian Bldgs., Cardiff.
Harrisons (London), Ltd., 66, Mark Lane, E.C.
Naval Colliery Co. (1897), Ltd., Cambrian Bldgs., Cardiff.
Newport Abercarn Black Vein Steam Coal Co., Ltd., Merthyr House, Cardiff.
Powell Duffryn Steam Coal Co., Ltd., Cardiff.
Rhymney Iron Co., Ltd., Merthyr House, Docks, Cardiff.

COAL HANDLING PLANT—
Spencer & Co., Ltd., Melksham, Wilts.

COMPASSES (Ship)—
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.

CONDENSERS—
Bellis & Morcom, Ltd., Birmingham.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Dawson & Downie, Elgin Works, Clydebank.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Royles, Ltd., Irlam, Nr. Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

CONDENSER TUBES (Brass and Copper)—
Yorkshire Copper Works, Ltd., Leeds.

CONTROLLERS & CONTROL GEAR—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-
Reyrolle, A., & Co., Ltd., Hebburn-on-Tyne.

CONVEYORS—
Mather & Platt, Ltd., Manchester.
Spencer & Co., Ltd., Melksham, Wilts.

COOKING APPARATUS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Grieve, T., & Sons, Bedford Street, North Shields.

COPPER PIPES—
Yorkshire Copper Works, Ltd., Leeds.

COPPERSMITHS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Royles Ltd., Irlam, Nr. Manchester.

COPPER TUBES—
Yorkshire Copper Works, Ltd., Leeds.

CORK INSULATION—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.

CORRUGATED IRON—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

COUNTER (Engine)—
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.

CRANES—
Ransomes & Rapier, Ltd., 32, Victoria St., S.W.
Stothert & Pitt, Ltd., Bath.

CYLINDERS (Copper)—
Yorkshire Copper Works, Ltd., Leeds.

DELTA METAL—
Delta Metal Co., Delta Works, East Greenwich, S.E.

DERRICKS & DAVITS—
Howden, James, & Co., Ltd., 95, Scotland Street, Glasgow.
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.

DISTILLING APPARATUS—
Royles Ltd., Irlam, Nr. Manchester.

DIVING APPARATUS—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, S.E.
Mining Engineering Co., Ltd., Meco Works, Moorfields, Sheffield.

DOCK & SHIP LIGHTING—
Carbic Ltd., 51, Holborn Viaduct, London, E.C.

DOCK GATES—
Chalmers, Wm., & Co., Ltd., Rutherglen, Nr. Glasgow.
Hamilton, Wm., & Co., Ltd., Port Glasgow, Scotland.
Swan, Hunter & Wigham Richardson, Ltd. Wallsend-on-Tyne.

BUYERS' GUIDE—*continued.*

DOORS (Watertight)—
British Thomson-Houston Co., Ltd., Rugby.
Stone, J. & Co., Ltd., Deptford, S.E.

DREDGE PLANTS—
Clelands, Wm., & Co., Ltd., Rutherglen, Nr. [Glasgow.
Stevens, Wm., & Co., Ltd., Renfrew, Nr. Glasgow.

DREDGING—
Docwra's Contracting & Dredging Co., Ltd., Queen Anne's Chambers, Westminster, London, S.W.

DRILLING MACHINES—
Cameron's & Hastie, Ltd., Dolphin Foundry, Leeds.

DRILLS—
Churchill, Hugh, Ltd., Gt. Tindal St., Birmingham.

DRILLS (Pneumatic and Electric)—
Chicago Pneumatic Tool Co., Ltd., Bradford.

DRY FITTINGS (Laundry)—
Bradford, T., & Co., Salford, Manchester.

DYNAMOS—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.

ELECTRIC CRANES—
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., [Belfast.
Trafford Park, Manchester. [on-Tyne.
Mactaggart, Scott & Co., Ltd., Loanhead, Edinburgh.
Mather & Platt, Ltd., Manchester.
Ransomes & Rapier, Ltd., 32, Victoria Street, London, S.W.
Stothert & Pitt, Ltd., Bath.

ELECTRIC DERRICKS—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRIC DYNAMOS & MOTORS—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRIC FITTINGS—
Dudgeon, Churchill & Co., Grimesthorpe, Sheffield.

ELECTRIC HEATING & COOKING APPARATUS—
British Thomson-Houston Co., Ltd., Rugby.
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.

ELECTRIC LAMPS—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.

ELECTRIC LIGHTING—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRIC LIGHTING PLANT—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRIC MOTORS—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRIC WIRES—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRICAL CONTRACTORS—
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow. [Glasgow.
Martin, W. C., & Co., 10, West Campbell Street, Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRICAL ENGINEERS—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.
Graham, Alfred, St. Andrew's Works, Crofton Park Road, S.E.
Holmes, J. H., & Co., Portland Road, Newcastle-
Mather & Platt, Ltd., Manchester. [on-Tyne.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRICAL INSTRUMENTS (Ammeters)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

ELECTRICAL INSTRUMENTS (Circuit Breakers)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

ELECTRICAL INSTRUMENTS (Relays)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

ELECTRICAL INSTRUMENTS (Voltmeters)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

EMERY WHEELS—
Sterne, L., & Co., Ltd., Crown Iron Works, Glasgow.

ENAMEL MANUFACTURERS—
Holzapfels, Ltd., Newcastle-on-Tyne.
Wailes Dove Bitumastic Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.
Websters Ltd., Hull.

ENGINE (Electric Light)—
Belliss & Morcom, Ltd., Birmingham.
Greenwood & Batley, Ltd., Albion Works, Leeds.

ENGINES (Marine)—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Central Marine Engine Works, West Hartlepool.
Fair, Walter D., & Co., 43, Leicester Square, London, W.C.
Hawthorn, R. & W., Leslie & Co., Ltd., St. Peter's, Newcastle-on-Tyne.
Howden, James, & Co., Ltd., Scotland St., Glasgow.
Perman & Co., Ltd., 82-83, Fenchurch Street, E.C.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

ENGINE & DECK STORES—
McGeoch, Wm. & Co., Ltd., 28, West Campbell Street, Glasgow.
Metallic Valve Co., Colonial House, Water Street, Liverpool.

ENGINE AUXILIARIES—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.

ENGINE FITTINGS—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

ENGINE-ROOM OUTFITS—
Grieve, T., & Sons, Bedford Street, North Shields.

ENGRAVERS—
Brown, Robert, & Co., 12, Espedair St., Paisley.

EVAPORATORS—
Central Marine Engine Works, West Hartlepool.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Royles, Ltd., Irlam, Nr. Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.

EXTRUDED METALS (Brass, Bronze, Copper, Delta Metals)—
Delta Metal Co., Ltd., E. Greenwich, London, S.E.

FANS—
Adam, J. M., & Co., Greenfield Iron Works, Dalmarnock, Glasgow.
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [Belfast.
Davidson & Co., Ltd., Sirocco Engineering Works,
Hogan & Wardrop, 2, Gresham Buildings, Basinghall Street, London, E.C.
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

FEED-WATER HEATERS—
Beresford Eng'n'ring Co., Beresford Lane, Cardiff.
Central Marine Engine Works, West Hartlepool.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Royles, Ltd., Irlam, Nr. Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.

FILES—
Brown, John, & Co., Atlas Works, Sheffield.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

FILTERS (Marine)—
Central Marine Engine Works, West Hartlepool.
Cockburns, Ltd., Cardonald, Nr. Glasgow.
Mather & Platt, Ltd., Manchester.

FIREBARS—
Liverpool Patents Co., Ltd., Derby Square, James Street, Liverpool.

FIRE EXTINGUISHERS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Mather & Platt, Ltd., Manchester.

FIRE-FIGHTING APPLIANCES—
Mining Engineering Co., Ltd., Meco Works, Sheffield.

FLAGS—
Speedings, Ltd., Sail Works, Sunderland.

FLOATING DOCKS—
Clelands, Wm., & Co., Ltd., Rutherglen, Nr. [Scotland.
Glasgow.
Hamilton, Wm., & Co., Ltd., Port Glasgow,
Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne.

FLOOR COVERING—
Docker Bros., Ltd., Metropolitan Road, Saltley, Birmingham.

FORCED DRAUGHT—
Adam, J. M., & Co., Greenfield Iron Works, Dalmarnock, Glasgow. [Belfast.
Davidson & Co., Ltd., Sirocco Engineering Works,
Howden, J., & Co., Ltd., Scotland Street, Glasgow.
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

FORGING PRESSES—
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
Mactaggart, Scott & Co., Ltd., Loanhead, Edinburgh.

FORGINGS—
Brown, John & Co., Ltd., Atlas Works, Sheffield.
Darlington Forge Co., Ltd., Darlington.
Hingley & Sons, Ltd., Netherton Iron Works, Staffs.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

FORGINGS (Bronze)—
Delta Metal Co., Delta Works, East Greenwich, London, S.E.

FORGINGS (Steel)—
Brown, John, & Co., Ltd., Atlas Works, Sheffield.
Darlington Forge Co., Ltd., Darlington.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

FUMIGATORS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.

FURNACE BRIDGES—
Hamilton, A., & Sons, 13, Bute Crescent, Docks, Cardiff.
McConnell, A., & Co., Ltd., 60, Drury Buildings, Water Street, Liverpool.

FURNACES—
Brown, John, & Co., Ltd., Atlas Works, Sheffield.
Deighton's Patent Flue & Tube Co., Ltd., Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.
Piggott, T., & Co., Ltd., Birmingham.

GALLEY GEAR—
Grieve, T., & Sons, Bedford Street, North Shields.

GALVANIZERS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

GAS ENGINES—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Mather & Platt, Ltd., Manchester.

GAUGES—
Chatwin, Thos., Ltd., Gt. Tindal St., Birmingham.

GEAR CUTTING—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

GEARING—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds

GEARS—
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

GEARS (Noiseless or Silent)—
British Thomson-Houston Co., Ltd., Rugby.
Brown, David, & Sons (Hfd.), Ltd., Huddersfield.

GOVERNORS—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.

GRAIN DISCHARGING PLANT—
Spencer & Co., Ltd., Melksham Wilts.

GRINDING MACHINES—
Greenwood & Batley, Ltd., Albion Works, Leeds.

GRINDING WHEEL MACHINES—
Sterne, L., & Co., Ltd., Crown Iron Works, Glasgow

HATCH COVERS (Patent)—
Hogg-Carr Construction Co., Ltd., Newcastle-on-Tyne.

HEATING APPARATUS—
Royles, Ltd., Irlam, Nr. Manchester.
Saunders & Taylor, Ltd., 43, Lower Mosley Street, Manchester.

HEATING ENGINEERS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Royles, Ltd., Irlam, Nr. Manchester.
Saunders & Taylor, Ltd., 43, Lower Mosley Street, Manchester.

HELM SIGNAL TELEMOTORS—
Mactaggart, Scott & Co., Ld., Loanhead, Edinburgh.

HIGH SPEED DRILLS—
Brown, John, & Co., Atlas Works, Sheffield.

HIGH SPEED STEEL—
Brown, John, & Co., Atlas Works, Sheffield.

HOISTS—
Mather & Platt, Ltd., Manchester.
Stothert & Pitt, Ltd., Bath.
Waygood-Otis, Ltd., Falmouth Road, S.E.

BUYERS' GUIDE—*continued.*

HOSE—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London, S.E.

HYDRAULIC CRANES—
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
Brown Brothers & Co., Ltd., Rosebank Iron Works, Edinburgh.
Mactaggart, Scott & Co., Ld., Loanhead, Edinburgh

HYDRAULIC MACHINERY—
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
Waygood-Otis, Ltd., Falmouth Road, S.E.

HYDRANTS—
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

INDIARUBBER—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London S.E.

INDICATORS—
Robinson, A., & Co., Ltd., Bootle, Liverpool.

INDUCED DRAUGHT—
Davidson & Co., Ld., Sirocco Eng'n'g W'rks, Belfast
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

INSULATIONS—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W. [Liverpool.
Liverpool Refrigeration Co., Ltd., Colonial House,

IRON ROOFS AND BUILDINGS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

JOINTING MATERIAL (Manganesite)—
Hudson & Co.'s Successors, John, 15, Victoria Warehouses, Mansell Street, E.C.

LAMPS AND LIGHTS—
Grieve, T., & Sons, Bedford Street, North Shields.
Kaye, Joseph, & Sons, Ltd., Leeds.

LAUNCHES—
Crichton, J., & Co., Saltney Shipyard, Chester.
Leitch, John, & Co., The Ferry, Renfrew, Scotland.
Livingstone & Cooper, Ltd., Hessle, Hull.
MacLaren Bros., Ltd., Dumbarton.
Perman & Co., Ltd., 82-83, Fenchurch St., E.C.
Seamless Steel Boat Co., Ltd., Wakefield.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, London, S.W.
Watson, J. S., Gainsborough.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

LAUNDRY MACHINERY—
Bradford, T., & Co., Salford, Manchester.

LAVATORY FITTINGS AND APPLIANCES—
Levick, John, Alma Street, Aston, Birmingham.

LEAD (Sheets and Pipes)—
Rimer Bros., Newcastle-on-Tyne.

LEAD (White and Red)—
Rimer Bros., Newcastle-on-Tyne.

LIFEBELTS AND BUOYS—
Speedings Ltd., Sail Works, Sunderland.

LIFTS (Window)—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.

LIFTS AND HOISTS—
Mactaggart, Scott & Co., Ld., Loanhead, Edinburgh
Waygood-Otis, Ltd., Falmouth Road, S.E.

LIGHTERAGE—
Alexander, W. H. J., St. John's Wharf, Wapping, E.

LIGHTERS—
Chalmers, Wm., & Co., Ltd., Rutherglen, Nr. Glasgow.
Crichton, J., & Co., Saltney Shipyard, Chester.
Watson, J. S., Gainsborough.

LIMEWASHING & DISINFECTING MACHINES—
Stonehouse Works Co., Ltd., Houghton Street, West Bromwich.

LOCKS—
Kaye, Joseph, & Sons, Ltd., Leeds.

LOCOMOTIVE TUBES (Copper & Brass)—
Yorkshire Copper Works, Ltd., Leeds.

LUBRICATORS— [Cranstonhill, Glasgow.
McRobie, John, & Sons, 94, Elliott Street,

MACHINE TOOLS—
Campbells & Hunter, Ld., Dolphin Foundry, Leeds.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Scriven & Co., Leeds Old Foundry, Leeds.

MACHINERY NAME PLATES—
Brown, Robert, & Co., 12, Espedair St., Paisley.

MAGNESIA—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.

MARINE ENGINEERS—
Bailey, C. H., Newport, Mon. Barry Docks.
Barry Graving Dock & Engineering Co., Ltd.,
Brown, John, & Co., Ltd., Clydebank, Nr. Glasgow.
Crichton, C. & H., Ltd., Huskisson Engine Works, Liverpool. [Southampton.
Day, Summers & Co., Ltd., Northam Ironworks,
Diamond, Thos., & Co., Cardiff.
Doxford, Wm., & Sons, Ltd., Sunderland.
Elliott & Jeffery, East Dock, Cardiff.
Gray, Wm., & Co., Ltd., West Hartlepool.
Harland & Wolff, Ltd., Belfast.
Harris Bros., Ltd., Cambrian Dry Docks, Swansea.
Hawthorn, R. & W., Leslie & Co., Ltd., Hebburn-on-Tyne.
Hill's Dry Docks & Engineering Co., Ltd., Cardiff.

MARINE ENGINEERS *(contd).—*
Livingstone & Cooper, Ltd., Hessle, Hull.
Mountstuart Dry Docks, Ltd., Cardiff.
Perman & Co., Ltd., 82-83, Fenchurch St., E.C.
Richardsons, Westgarth & Co., Ltd., Hartlepool, Middlesbrough and Sunderland.
Shearman, John, & Co., Ltd., Cardiff.
Simons, Wm., & Co., Ltd., Renfrew, Nr. Scotland.
Stephen, Alex., & Sons, Ltd., Linthouse, Govan, Glasgow.
Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne. [Westminster, S.W.
Thornycroft, John I., & Co., Ltd., Caxton House,
Wallsend Slipway & Engineering Co., Ltd., Wallsend-on-Tyne.
White, J. Samuel, & Co., Ltd , East Cowes, I.W.
Workman Clark & Co., Ltd., Belfast.
Yarrow & Co., Ltd., Glasgow.

MARINE GOVERNORS—
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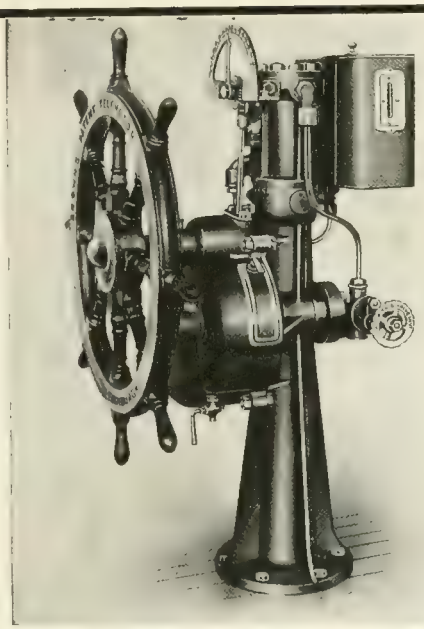

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and
Patent Hawse-Pipe Deck Flange
(British and Foreign Patents, 1913).

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Iron and Brass Founders,
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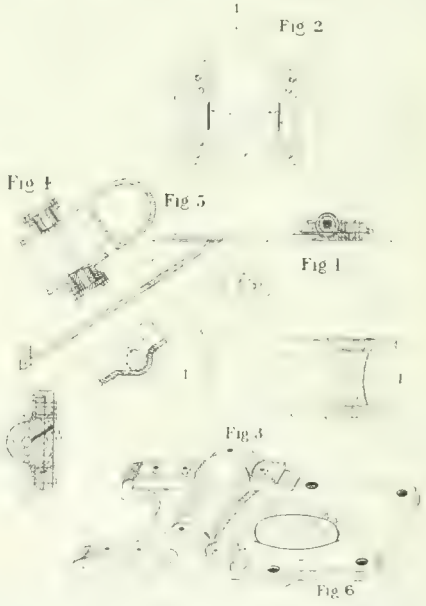
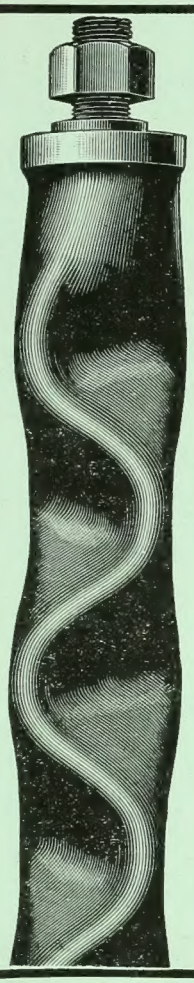
Makers of HAMILTON'S PATENT FURNACE BACK BRIDGE with HAMILTON'S PATENT "V" GROOVED FIREBARS.



The Staffordshire Tube Co., Ltd.,
BIRMINGHAM.



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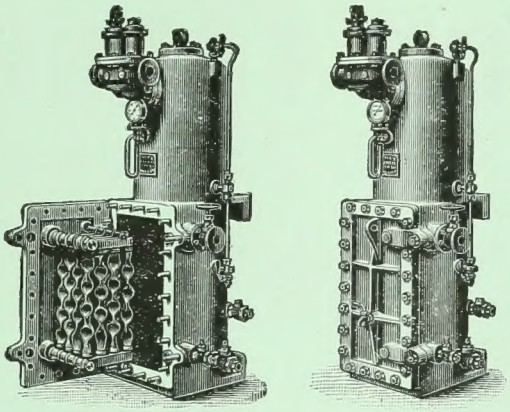
THAN ANY OTHER SYSTEM.



THE "ROW" EVAPORATOR.
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Row's Patent Tube, shown in the margin, which is the leading feature of these Specialities, is **Twice as Efficient** as plain round tube service, and the advantage accruing is obvious. The Tube has a remarkable property of casting scale.

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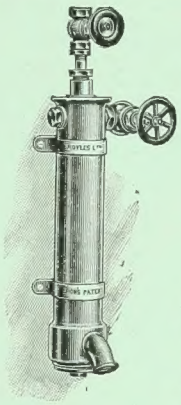
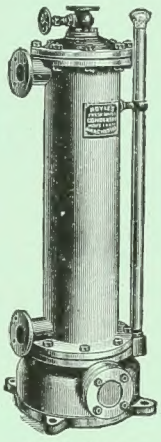
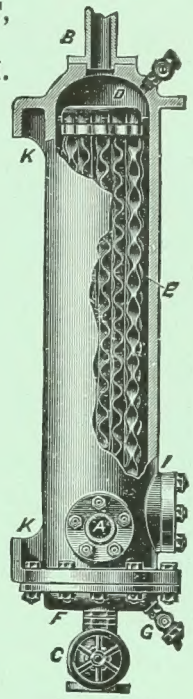


Instantaneous Water Heater for Ships' Baths & Lavatories.



FRESH WATER CONDENSER.



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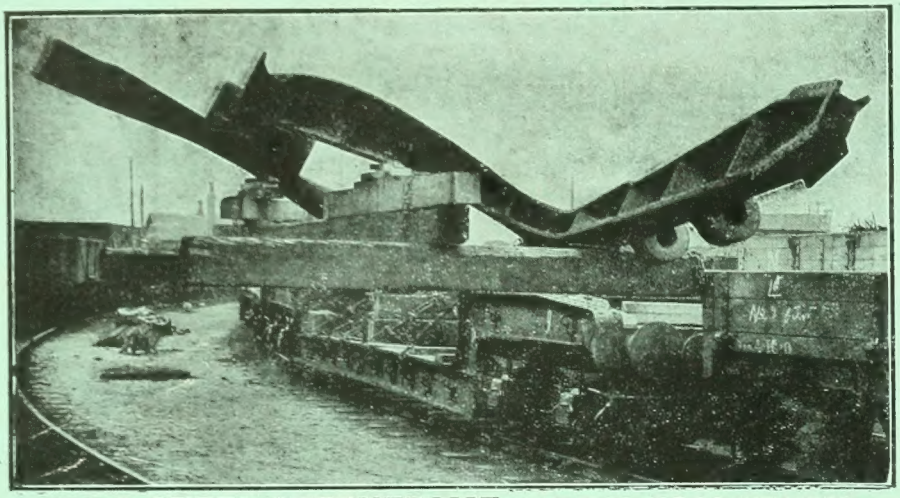

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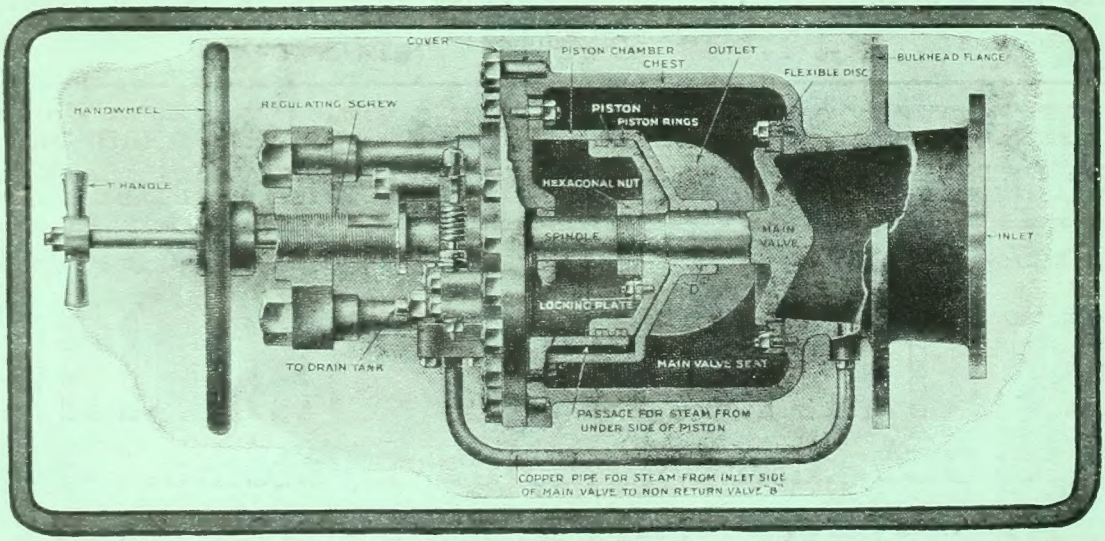

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London: Printed by Harrison & Sons, Printers in Ordinary to His Majesty, 45, 46 and 47, St. Martin's Lane, London, W.C., and published by the Proprietors of Shipbuilding and Shipping Record, at Queen Anne's Chambers, Broadway, Westminster, London, S.W. *December* 2, 1915.